SERVICE MANUAL

AUTO VARI—64

ACCESSORY

MODEL

101100

101300

CAUTION
SEE SAFETY NOTICE ON
INSIDE COVER SHEET

HOOO-006181

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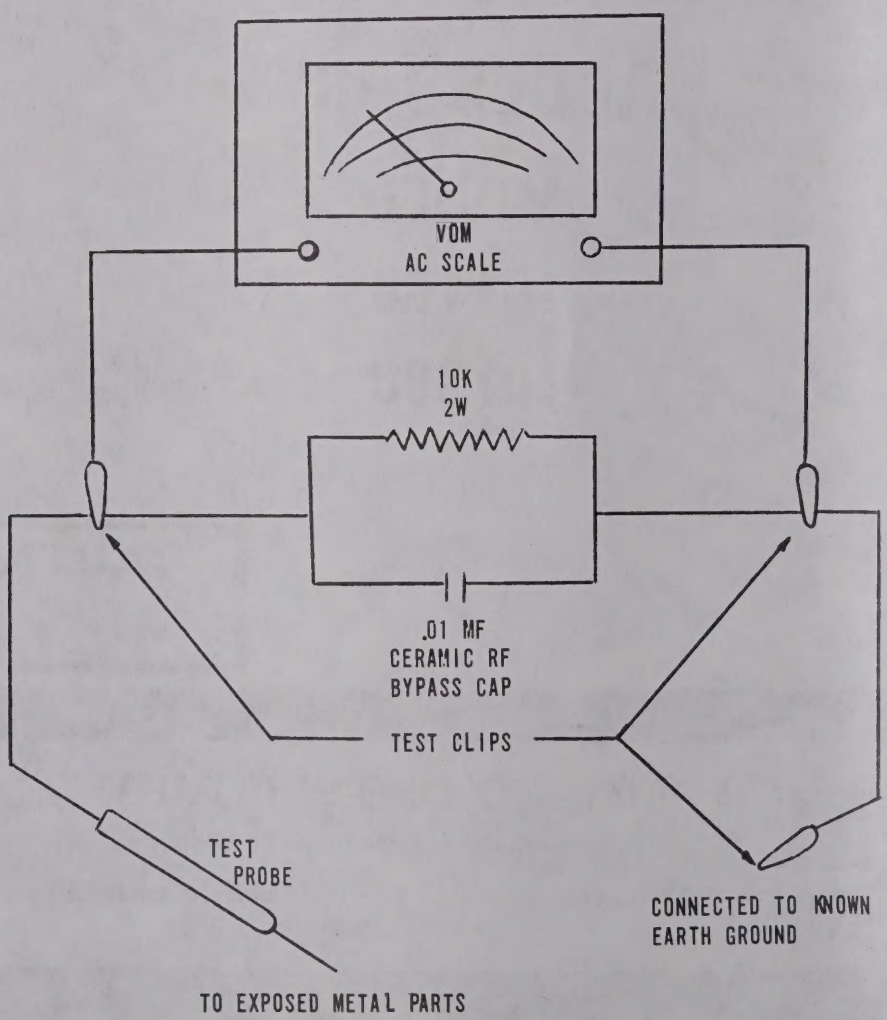
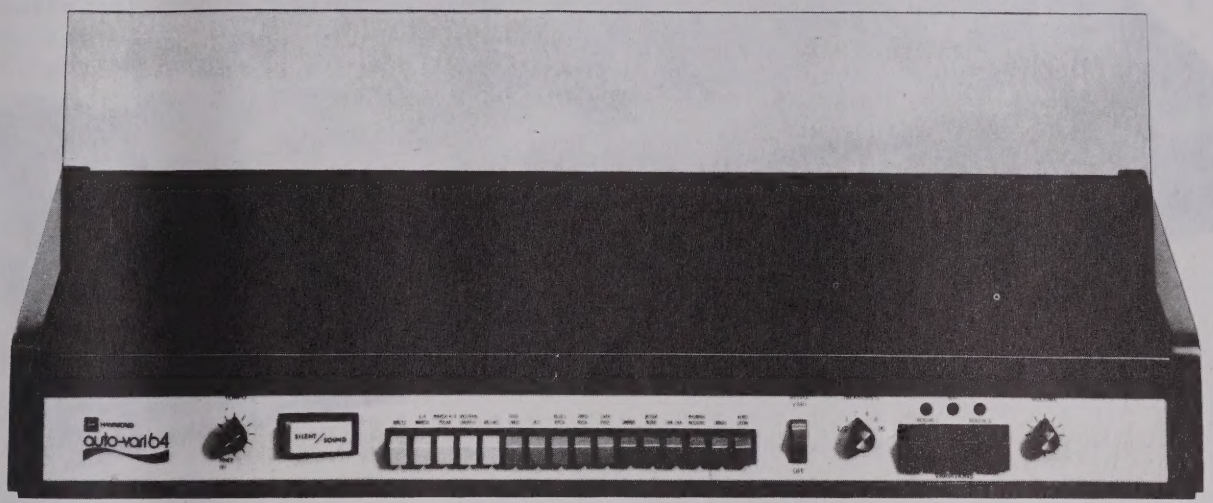
SAFETY NOTICE

Great care has been taken in the design and manufacture of this product to assure that no shock hazard exists on any exposed metal parts. Internal service operations can expose the technician to hazardous line voltages and accidentally cause these voltages to appear on exposed metal parts during repair or reassembly of product components. To prevent this, work on these products should only be performed by those who are thoroughly familiar with the precautions necessary when working on this type of equipment.

To protect the user, it is required that all enclosure parts and safety interlocks be restored to their original condition and the following tests be performed before returning the product to the owner after any service operation.

Plug the AC line cord directly into a line voltage AC receptacle (do not use an isolation transformer for this test) and turn the product on. Connect the network (as shown below) in series with all exposed metal parts and a known earth ground such as a water pipe or conduit. Use an AC VOM of 5,000 ohms per volt or higher sensitivity to measure the voltage drop across the network. Move the network connection to each exposed metal part (metal chassis, screw heads, knobs and control shafts, escutcheon, etc.) and measure the voltage drop across the network. Reverse the line plug and repeat the measurements. Any reading of 4 volts RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the product to the user.

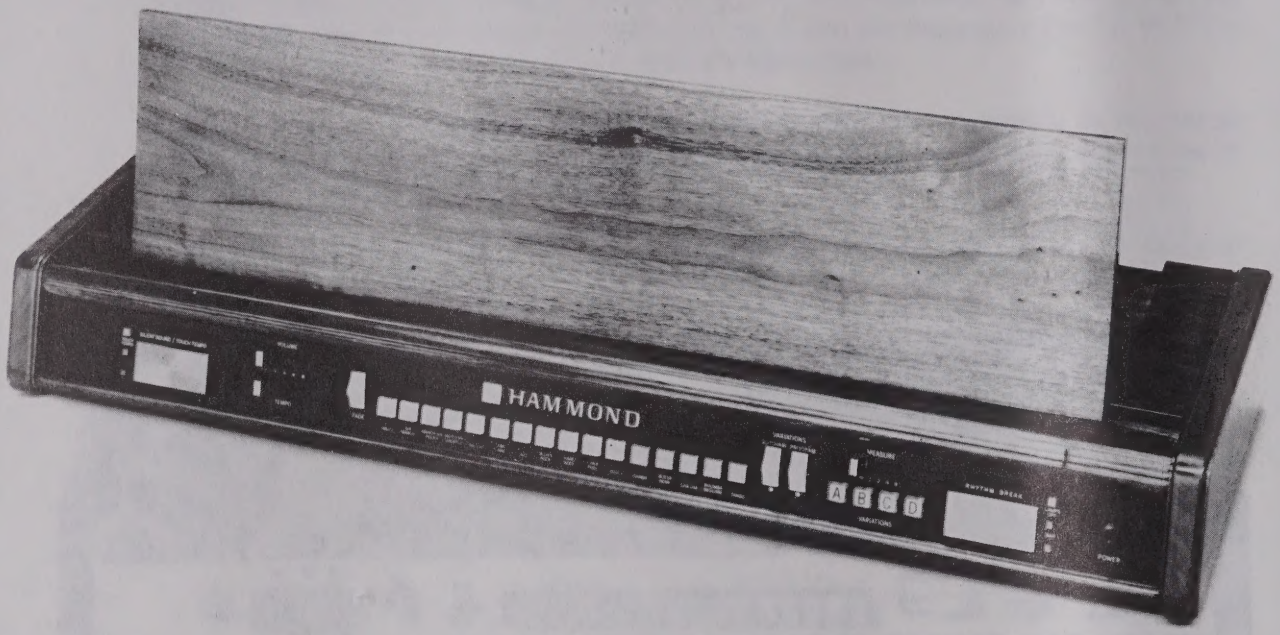




MODEL 101100

Dimensions: 31" wide; 11" deep; 10 3/4" high with music panel up.

Weight: 20¼ pounds.



MODEL 101300

Dimensions: 35¼" wide; 11 1/8" deep; 4½" high and 11½" high with music panel up.

Weight: 22 pounds.

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SECTION I
HOW THE UNIT OPERATES

MODEL: 101100

GENERAL

The Auto Vari®-64 accessory is a self contained unit, with its own power source. However, it does require an external amplifier and speaker.

PATTERNS

There are sixteen rhythm patterns (WALTZ thru TANGO) controlled by interlocking push-buttons which can be depressed singularly or in combination. All of the buttons select 4/4 time rhythm patterns, except two which select 3/4 time. They are WALTZ and MARCH 6/8.

VARIATIONS

There are four VARIATIONS activated by lighted push-buttons A, B, C and D for each of the sixteen patterns. The VARIATIONS are controlled by an AUTO VARI slide switch and rotary MEASURE switch. When the AUTO VARI switch is "on" the VARIATIONS advance (A, B, C, D, A.....) in accordance with the MEASURE rate (1/2, 1, 2, 4, 8, 16) selected.

SILENT/SOUND

As its name suggests, moving the rocker to the SOUND position enables the pattern voice selected, beginning at beat one of measure one.

In the Auto Vari mode of operation it will also reset to VARIATION A.

TEMPO

A rotary TEMPO pot is provided to vary the rate from 12 to 75 measures per minute. Turning the knob to the far left, shuts "off" power to the unit.

VOLUME

The output level of the rhythm patterns are fully adjustable by means of a VOLUME pot.

INDICATOR LAMPS

The three LED lights located above the A, B, C and D VARIATIONS display the tempo and measure of the rhythm unit. The two red lamps MEASURE I and II remain "on" during their respective measures. A yellow light is used to indicate TEMPO and flashes three times per measure for WALTZ and MARCH 6/8 and four times per measure for all other patterns.

FOOT SWITCH

An input jack located in the rear panel allows the connection of an accessory FOOT SWITCH to silence the rhythm.

AUDIO OUTPUT

Located in the rear panel is a 1/4" output jack to connect the rhythm unit to any suitable amplifier and speaker system.

BALANCE CONTROL

Mounted in the rear panel is a center detent control to adjust the high and low frequency content of the output signal. This adjustment may be neccessary to compensate for room accustics or sound system respone characteristics.

MODEL: 101300

GENERAL

The Model 101300 rhythm accessory unit operates in the same manner as the Model 101100 previously described, with the exception of changes in the PATTERNS, VARIATIONS, SILENT/SOUND, TEMPO and INDICATOR LAMPS sections. To explain the additional features of the Model 101300, PROGRAM, RHYTHM FADE, RHYTHM BREAK and LAMPS OFF sections have been added.

PATTERNS

In this section the AFRO-LATIN pattern has been replaced by DISCO which is now located to the right of LIVERPOOL. The patterns are now controlled by lighted push-buttons which may also be used in combination.

VARIATIONS

The VARIATIONS operate as described earlier, however the MEASURE switch is now slide type with positions 1/2, 1, 2, 4 and 8. In addition, the fixed (A, B, C, D, A.....) sequence may now be altered. (See PROGRAM section)

PROGRAM

The AUTO VARI switch, when activated, automatically changes the VARIATION of the pattern, either in a fixed sequence of A, B, C, D, A.....(PROGRAM switch "off") or a programmed sequence (PROGRAM switch "on"). Programming of the VARIATIONS is accomplished by turning "on" PROGRAM, with Auto Vari "off" and depressing any combination of VARIATION buttons, up to a maximum of sixteen. Turning "on" the AUTO VARI switch then activates the sequence. The sequence is reset to the fixed mode when the PROGRAM switch is turned "off".

SILENT SOUND/TOUCH TEMPO

This "touch pad", as its name implies, has two modes of operation. In the SILENT SOUND mode, when the TOUCH TEMPO push-button is "off" (not lighted), "tap" the pad once for the rhythm to sound and once again to silence the pattern. The speed in this mode is determined by the TEMPO slider position. The TOUCH TEMPO mode of operation is activated when the amber TOUCH TEMPO button is "on" (lighted). Tap the pad three times to program the speed and once again to start the thythm. During the first three taps the red indicator is lit. The fourth tap lights the green indicator and cancels the red. While the rhythm is running the green light is "on", in either mode.

RHYTHM FADE

Activating the FADE switch once causes the rhythm volume to gradually become inaudible (approximately 10 seconds). To return to the level set by the VOLUME pot operate the FADE switch again or perform a Stop/Start cycle.

RHYTHM BREAK

There are six breaks assigned to twelve specific rhythm patterns. The break assignments are shown in Table 1. A RHYTHM BREAK is initiated by touching the break pad at any time when one of the patterns with an assigned break is playing. The amount (number of beats) of break that one hears is determined by the time of initiation.

If the break is triggered at the start of measure one beat one, two full measures of the break will play. If the break is triggered at any time after beat one measure one, only the remaining period of the two measure cycle will play. This musical logic was established to prevent the break from getting out of step with the basic pattern. However, it also permits the player to do creative drum fills with 2 or 3 beat (etc.) breaks.

A break may be played as an introduction simply by touching the break pad before starting the rhythm pattern with the SILENT/SOUND pad.

TABLE 1

RHYTHM BREAK ASSIGNMENTS

BREAK	PATTERN USE
1	Disco, Cha-Cha
2	March 4/4, Polka, Dixieland
3	Western/Shuffle, Jazz
4	Samba, Bossa Nova, Rhumba/Beguine, Tango
5	Ballad
6	Hard Rock

NOTE: Waltz, March 6/8, Blues Rock and Liverpool are not assigned a break pattern.

INDICATOR LAMPS

There are two red LED indicators in the Model 101300 that display tempo and measure. BAR I flashes once every beat during the first measure of the pattern selected. Similarly BAR II flashes the tempo during the second measure.

LAMPS OFF

LAMPS OFF is a momentary amber push-button located above the BAR I (measure I) and Bar II (measure II) indicators. When this button is depressed, the rhythm unit and lights, except the red and green indicators in the TOUCH TEMPO pad, are disabled. To reactivate the rhythm, depress any pattern button.

SECTION II
THEORY OF OPERATION

MODEL: 101100

GENERAL

This section describes in detail the circuit operation for each of the three Printed Wiring Boards (PWB's) used in the Auto-Vari accessory unit. Note that these PWB's are also used in making the in-built version of the rhythm unit which incorporates Auto-Accompaniment and Follow-The-Player voices. Please disregard references to these features in the text.

Refer to Section V for appropriate PWB schematic.

(379) PATTERN GENERATOR PWB 124-000379

This board contains the 075-000430 custom Rhythm IC which is basically the heart of the Auto-Vari 64. This IC has a programmable pattern memory, sixteen D.C. controlled pattern inputs, twelve outputs for eleven voices and one Auto-Accompaniment signal. There is a separate gate input which will disable the eleven voice outputs. This gate is not used in the Rhythm unit. There is a clock input which is used to drive the internal decoding circuits. The clock input frequency varies from 4.8 HZ to 30 HZ and drives the 24/18 count address decoder. The five counter stages which make up the address decoder are designated X1 through X5, with only X3, X4 and X5 outputs brought out of the IC. Divider X5 drives divider Y1 which in turn drives the measure decoder. Divider Y1 feeds Divider Z1 which provides one of switch selectable outputs for driving the Variation decoder. When either of the two 3/4 time patterns is activated, the decoding logic automatically changes the address decoder from a 24 count measure to an 18 count measure. There are two Variation control inputs which are fed by dividers Y2 and Y3 on the Variation board. The "430" Rhythm I.C. decodes these inputs into one of four possible variations. The tempo of the Rhythm Unit is controlled by a 500K potentiometer located on the front panel of the Rhythm Unit. The tempo control is connected to J1-J13 and controls the amount of charging current for capacitor C1. The voltage across C1 will increase until it is greater than the voltage at the junction of R5 and R6. Transistor Q1, a programmable uni-junction transistor, will then turn on and discharge C1 through resistor R4. This discharge current will turn on transistor Q17, which is used to amplify the output of Q1 for the +14 volt signal required to drive the clock input of the "430" Rhythm I.C.

Transistor Q2 and Q3 from a "Set-Reset" Flip-Flop which stops and starts the Rhythm Generator. The inputs at J1-1 and 2 are "start" inputs and J1-3 is a "stop" input. With either the Silent/Sound rocket or an input from the lower manual or pedal during "Touch-Start Mode", transistor Q2 will turn on and Q3 will turn off. With Q3 off, a +12 volt signal is applied through R17 and R18 to turn on transistor Q4. This "on" signal can be interrupted by the Foot Switch through J1-7 and diode D1 without changing the state of Q2 or Q3. When Q4 turns on , a "ground" signal is applied to a common bus connecting all normally open rhythm pattern switches together. Therefore, with a rhythm switch depressed, a "ground" signal will be applied to one of the I.C. pattern inputs and "enable" the rhythm generator.

Transistor Q3 also couples a positive signal through C2, R21 and Q6. Transistor Q3 also couples a positive signal through C2, R21 and Q6. Transistor Q6 turns "on" and provides a reset pulse to pin 20 of the rhythm I.C. This reset pulse is inverted by transistor Q5 and used to reset the Y2-Y3 dividers and the variation dividers Z2-Z3 on the Variation board. The reset pulse from Q6 is also coupled through C3, R38 and D6 (during Auto-Accompaniment Mode only) for the first low bass note each time the rhythm is started.

Transistors Q7 through Q10 provide the "ground" signals for the automatic switching of the organ from Auto-Accompaniment mode to "organ" mode when the Auto-Accompaniment mode switch is on.

Transistor Q9 is normally supplied a +14 volt signal through R25, R26 and R30. Transistor Q9 provides the low impedance necessary to turn on Q10 through the current limiting resistor R31. Transistor Q10 will "ground" all negative signals applied to J1-10 from the organ. When the Foot Switch (located on the organ swell pedal) is activated, a ground is applied to J1-7 and connected to the junction of R26, R30 and Diode D1. The "ground" removes the +14 volt signal normally applied to Q9, thereby turning off transistor Q9 and Q10. Transistor Q7 will now turn on and supply current through R28 to Q8. Transistor Q8 will now "ground" all negative signals applied to J1-11. Transistor Q8 and Q10 can "sink" up to 8ma. from a negative voltage source.

Transistor Q16 is a pulse inverter for the automatic accompaniment signals. Capacitor C11 and resistor R69 form the differentiation network for the negative accompaniment output pulses. Diode D13 shunts the negative accompaniment signal to ground through J1-15 and the Auto-Accompaniment switch when Auto-Accompaniment is off.

The high and low bass output signals are formed by transistors Q12 and Q11 respectively. The input to transistor Q11 is the X5 square wave output from the "430" I.C. This output is routed through the normally closed contacts of the Waltz and 6/8 March rhythm pattern switches to the base of Q11. The output of Q11 is differentiated by C4 and R36, with the negative pulse passing through D3 (with Auto-Accompaniment on) to the low bass output. The frequency of X5 is one cycle per measure, thereby causing Q11 to generate a negative pulse at the beginning of each measure. Transistor Q12 inverts the output of Q11 and generates a negative pulse (through C5, R41. R42 and D10) during the middle of each measure. If either 3/4 time rhythm button is depressed, the X5 input to Q11 will be disconnected and Q11 will be connected to the Y1 divider output. The Y1 divider output will cause the low bass note to sound at the beginning of measure 1 and the high bass note to sound at the beginning of measure 2. The high bass, low bass, and accompaniment organ signals are shunted to ground through diodes D13, D4, D5 and D11 when the Auto-Accompaniment switch is "off".

Transistors Q13 and Q14 form an astable multi-vibrato with a frequency of approximately 20 HZ. This astable is turned on whenever the Rhythm I.C. supplies a +14 volt drum roll signal from I.C. pin #38. The output of the astable is amplified by transistor Q15 which supplies a low impedance (2,200-ohm) signal to the snare drum output through diode D9.

The ten voice outputs (J2-3 through J2-12) are connected directly to the I.C. voice output pins. These outputs provide low impedance (2,000-ohm) positive-going drive pulses which are wired directly to the voicing circuits on the Voicing PWB.

(380) VOICING BOARD 124-000380

The Auto-Vari voicing board contains eleven voices, ten of which are used for the automatic rhythm and one (brush) is only for external keying (lower manual). There are also three prime inputs such as Bass Drum (Pin 11), Snare Drum (Pin 16) and Cymbal (Pin 3), which also are only used for external keying purposes.

There are six basic circuits on this PWB which are listed:

A. Phase Shift Oscillator - There are eight phase shift oscillators which are used for the following voices: Bass Drum (1), Conga (1), Bongo (1), Claves (1), Rim Shot (1), Cowbell (2) and Snare Drum (1).
B. White Noise Generator - There is a white noise generator which supplies all the white noise gates with a board band white noise signal.
C. White Noise Gate - There are four white noise gates which are used for the following voices: Snare Drum, Rim Shot (1), Sand Block (1), Cymbal and Maracas (1).
D. Preamplifiers - There are two preamplifiers used to collect and amplify rhythm output signals. One preamp is used for all low frequency voices (phase shift Oscillators) while the other is used for all white noise voices.
E. Pulse Inverters - There are two pulse inverter circuits which convert negative organ pulses to positive pulses for voice triggers. One circuit is used for pedal pulses while the other is used for lower manual pulses.
F. Power Supply - There is a +14 volt power supply which supplies all three rhythm boards with a stable supply voltage

The phase shift oscillators are used to generate all low frequency (60 HZ to 2,500 HZ) voices. These oscillators are turned on by a positive keying pulse which provides bias to the oscillator transistor. An R-C time constant at the input of each oscillator circuit determines the length of time the oscillator is on.

An example of phase shift oscillator circuit is the Bass Drum voicing circuit. The input keying pulse is applied to Pin 12 and is differentiated by C1 and R3. Diode D1 allows only the positive pulse to charge capacitor C2. Capacitor C2 and resistors R6 and R8 form the oscillator time constant circuit. Capacitor C3 (used only on Bass Drum and Conga circuits) is used to couple a part of the input pulse directly to the base of Q1, which causes transistor Q1 to be driven into saturation for a short time. This condition creates the "thump" or "strike" tone when the bass drum first sounds. Resistors R1 and R8 provide a small amount of forward bias (.42 volts) in order to give the voice envelope a long "tail". Capacitors C4, C5 and C6 and resistors R4 and R5 determine the frequency of the oscillator. Resistors R2 and R9 determine the collector current when the oscillator is turned on. Resistor R10 controls the amount of bass drum signal applied to the low frequency preamplifier. Note that all other low frequency oscillators have capacitors in series with the output level resistor (such as C12 for Conga). This series capacitor is used to remove some low frequency components from the voice output.

The white noise is generated by transistor Q9 by reverse biasing the emitter-base junction into a zener region. The zener current is controlled by R77. The white noise output passes through capacitor C45 to the base of a common emitter amplifier (Q10). The white noise output is controlled by potentiometer R79, and is adjusted for a nominal peak-to-peak reading of 200 millivoits. The output of the white noise potentiometer is connected to four white noise gates through four capacitor/resistor isolation networks.

The white noise gate (Q11) for the Snare Drum is also used for the Rim Shop voice. A positive Snare Drum input applied to Pin 15 is coupled through C58 and D11 to charge up capacitor C44, which discharges through R73 and the base of transistor Q11. With Q11 turned "on", white noise coupled to the base of Q11 by R81 and C48 is amplified by Q11. Capacitor C46 and C47 shape the white noise frequency spectrum and resistor R76 controls the output level. The Rim Shot input (Pin 13) is coupled through C25, D9 and R72 to the white noise gate.

The Brush white noise gate (Q12) is similar to the Snare Drum noise gate except that the output frequency spectrum is shaped by a 12K HZ resonant tank circuit (L2 and C61). The output level of the Brush circuit is controlled by potentiometer R97.

The Sand Block is a DC-controlled voice and does not have a percussive envelope as the other white noise voices do. The input pulses are coupled directly to Q13 through R99, R101 and D14. The output frequency spectrum is shaped by C51 and C52. The output level is set by potentiometer R102.

The Cymbal and Maracas voices share the same white noise gate, but each voice has its own separate time constant circuit.

The Cymbal has a dual slope time constant with the initial attack controlled by C65 and R107, while the rest of the time constant is controlled by C54 and R104. Both Cymbal and Maracas time constants are connected directly to the base of Q14, the white noise gate. The output of Q14 is shapped by L1 and C55, and 8K HZ tank circuit. The output level of the Cymbal/Maracas white noise gate is controlled by R88.

Transistors Q18 and Q19 are used for the low frequency preamplifier, which amplifies the outputs of all phase shift oscillator voicing circuits. Potentiometer R127 is used to adjust the gain of the low frequency output channel.

Transistor Q17 is the high frequency (white noise) preamplifier. The output level of the preamp is controlled by potentiometer R121.

Transistor Q15 and Q16 form the two pulse inverters needed to convert -27 volt organ signals to +14 volt pulses for keying the "Play-Along" voices. Pedal signals are applied to Pin 21 and converted to +14 voit signals by Q15. The output of Q15 passes through R114 to two operator selectable switches: Bass Drum on Pedals and Cymbal on Pedals. The outputs of these switches connect to Pins 11 and 3 respectively on the Voicing Board. Transistor Q16 operates in an identical manner for lower manual signals. Diodes D19 and D20 couple lower manual and pedal trigger pulses to the Touch Start circuit on the Pattern Generator Board.

The +14 volts used to operate all Auto-Vari circuits is supplied by R131 and a 14 volt zener diode D21. Capacitor C76 is used to slow down the initial "turn-on" of the supply voltage and help in absorbing power supply spikes generated by various Auto-Vari circuits. Resistor R129 and capacitor C75 are used to decouple the preamp power supply from the main +25 volt power supply input.

(384) VARIATION BOARD 124-000384

The Variation Board provides the following circuits:

A. Two cascaded dividers which provide the "8" and "16" measure signals for the Auto-Vari measures switch.
B. A four-station lighted pushbutton switch assembly with associated I.C. divider, decoding circuits and variation switch lamp amplifiers.
C. Transistor lamp amplifier for Tempo, Measure I and Measure II.

A CMOS "Dual D" divider package (I.C. 2) is used to provide the "8" and "16" measure signals for the automatic variation mode. The first divider input, Z1-Pin 12, is connected directly to the Z1 output of the Pattern Generator Board. The first divider output (Z2) is one half the frequency of the input and Z3 is one fourth the frequency of the input. The outputs are +14 volts square waves which are wired directly to the "8" and "16" positions of the measures switch. The reset input (Pin 13) receives a +14 volt reset pulse each time the rhythm unit starts sounding.

The output of the measures switch is connected through a .01 mfd. capacitor to the Auto-Vari switch. When the Auto-Vari switch is "on", this signal is connected through the variation clock input (Pin 6) to R16, D1, R17 and Pin 3 of I.C. 1. These components are used to differentiate the various clock input signals and drive the two cascaded dividers (I.C. 1). The divider outputs, which are designated Y2 (first stage) and Y3 (second stage), are used to drive the variation decoding circuit inside the rhythm I.C. and the "2 input and" circuits which drive the four variation lamps. The "and" circuit for variation A is comprised of D10, D11, R29 and Q8. Diodes D12 and D13 are used to bias the emitters of Q5-Q8 at approximately +1.6 volts. This bias is needed because of a possible high "0" level at the output of the I.C. When Y2 and Y3 are both at a "1" level, D10 and D11 will be reverse biased and R29 will supply base current to Q8 which will then turn on and light variation lamp A.

The reset input (Pin 8) receives a +14 volt reset pulse when the Auto-Vari switch is ON and the rhythm unit is switched from SILENT to SOUND. This reset pulse sets both Y2 and Y3 dividers to the "1" state through diodes D2 and D3. The "1" state programs the "430" I.C. for vairiation "A". The variation clock will then cause the variation to change in a A-B-C-D-A sequence.

The tempo lamp is driven by an amplifier comprised of transistors Q1 and Q2. The input clock is provided by the X3 divider in the rhythm I.C. This clock is differentiated by C1 and R7 and provides an "ON" time of approximately 15 milliseconds.

The Y1 divider output from the rhythm I.C. is used to drive transistor Q4, the Measure I lamp amplifier. An output from the Measure I circuit, located at the junction of R13, Pin 22 and the anode of the Measure I L.E.D., is used to drive transistor Q3, the Measure II lamp amplifier. When Measure I lamp is "ON", transistor Q3 and the Measure II lamp will be OFF. When Measure I lamp is OFF, transistor Q3 will receive input drive current from R12 and turn "ON", lighting the Measure II lamp.

(418) VARIATION PWB 124-000418

Later production units of the Model 101100 incorporated the 124-000418 Variation PWB in place of the 124-000384. Due to the similarity of the two boards, please refer to the 124-000384 theory of operation for explanation of the 124-000418 circuits.

(426) VOICING PWB 124-000426

In later production units the 124-000380 Voicing board was replaced by the 124-000426 PWB. The major difference concerning the two boards is the way in which the white noise is developed. On the 124-000426 assembly of the white noise signal is generated by means of an 075-000300 integrated circuit. The rest of the circuit--ry is common to the 124-000380 Voicing PWB. Please refer to the previously described theory of operation.

MODEL: 101300

GENERAL

Just as in the case of the Model 101100, the 101300 also has an in-built version. Please disregard references in the text to those features which are not applicable to the accessory unit.

Refer to Section V for appropriate PWB schematic.

(648) AUTO VARI 64 PWB 124-000648

NOTE: All component, terminal and signal identification refer back to the logic diagram unless bracketed by these symbols [], in which case the schematic diagram must be consulted.

I. INITIAL CONDITIONS

A. 'Power Up'

When power is applied to the Rhythm Unit, a power up pulse (J61- 3, 2), generated by IC 15e [C20 and R60], is sent to the 'Lamp On' (IC 9b), Silent/Sound (IC 25b), Pattern/Break (IC 17b) Flip-Flops and the 450 Voicing Generator's master reset input [IC 3, Pin 31]. This pulse ensures the Rhythm Unit will come on reset, in silent mode, ready for pattern selection.

B. 'Lamp On'

The 'Lamp On' F-F (IC 9b) controls the enabling of all indicators with the exception of the Silent/Sound LED's. The power-up pulse resets the F-F, which enables the Tempo/Measure indicator logic (IC 8b, IC 10a, IC 15f), allowing information, Y1 (J61- 9), X3 (J61- 8), from the 460 [IC 1, Pin 26, 23] to alternately pulse the measure indicators at a rate determined by the setting of the Tempo Pot (or Touch-Pad). Resetting the 'Lamp-On' F-F also enables the A-V indicator logic (IC 22) allowing variation information to be displayed and disables the pattern lamp cancel bus allowing user selection of any pattern(s).

Closing a pattern switch, although not affecting the state of the 'Lamp On' F-F, will pulse the pattern lamp cancel line 'Lo' (-14V) through a one shot [Q17, C18] and a NOR gate (IC 8a). This pulse is sufficient speed that the cancel operation is completed before contact is broken at the selected pattern switch, allowing only the pattern(s) you are immediately selecting to be activated on release of the switch(es).

II. CONTROL LOGIC

A. Pattern Switch Latches

Each pattern has (identical) latch circuitry (IC 4-7, Q1-Q16) because of the momentary action of the pattern switches. The typical latch is made up of one NAND gate (i.e. IC 4c) and one transistor (i.e Q1) in a positive feedback arrangement.

B. Lamp Cancel

Pattern latches can be unlatched in one of three manners, as previously described selecting a new pattarn automatically cancels all previous selections. With the second, combination of at least three patterns may be selected and operated simultaneously. When between four and six rhythm patterns are selected (depending on transistor's, Q18, Hfe) the auto light cancel circuit (Q18, 19) will set the 'Lamp On' F-F (IC 9b). This disables the pattern latches (IC 4-7, 01-16), variation switching logic (IC 22), and Tempo/Measure logic (IC 8b, IC 10a, c, d, IC 15f). The Flip-Flop can also be set by closing the light cancel switch (J52-1), located on the front panel, with the same lamp disabling results.

C. Silent/Sound

As mentioned previously the power up pulse (J61- 2, 3) resets the Silent/Sound F-F (IC 25b) to ensure that the Rhythm Unit is in the silent mode when turned on. Logic (IC 23c, d) is used to allow either power up or a 'Hi' (Gnd) output on the 'stop' line [IC 3, Pin 13] to put the unit into stop mode. The Silent/Sound F-F is wired so it will toggle each time it receives a clock pulse from the Silent/Sound Touch Pad through logic (IC 28c, d). Unless the Touch Tempo switch (J54- 1) is depressed (holding IC 28c at -14V) every touch of the Silent/Sound pad (J57- 3) will cause a transition from Silent to Sound (or vice versa).

In the Touch-Tempo mode, transition from Silent to Sound is caused by a 'Hi' output (Gnd) on the 'Run' line [450, Pin 14] setting the Silent/Sound Flip-Flop. The Silent/Sound F-F's outputs feed driver transistors (Q28, 29) whose outputs (J55- 4, 2) control the Silent/Sound indicators.

D. Pattern Enable/Reset Logic

The pattern enable (J63- 3, 6) and reset lines (J63- 2, 7) are controlled by the state of the Silent/Sound F-F (IC 25b), the status of the foot switch reset (J55- 1), foot switch (J63- 1), and touch start (J56- 6) switches and the status of lower manual legato and pedal down information.

The foot switch reset switch serves to enable a NAND gate (IC 27b) whose output, upon activating the foot switch goes 'Lo' (-14V). This output feeds the reset gate (IC 27c) both directly and indirectly, through logic that also controls the pattern enable signal (J63- 3, 6). When the unit is in the sound mode and the foot switch reset switch is on, the output of the foot switch NAND gate (IC 27b) enables the reset out logic (IC 27c, IC 26c) at the instant the foot switch is closed. Also occuring in this instant is the generation of a pulse by a NAND gate (IC 27d) capacitively coupled to the reset gate (IC 27c), this pulse resets the pattern (460), break (462), and voicing (450), generators. This NAND gate (IC 27d), simultaneous with generation of a reset pulse, disables the pattern enable logic (IC 26b, IC 24b) stopping the Rhythm Unit. If the foot switch reset is left open and only the foot switch is depressed, the other line to the pattern enable logic is brought 'Hi' (Gnd) disabling pattern enable as long as the foot switch is held back. However, no reset occurs.

If the Touch Start switch is closed before the unit is cycled into sound mode, pattern enable is held off by control logic (IC 23a, IC 28a, b), preventing the sound signal from entering the logic and activating the pattern enable gate (IC 26b). This situation exists indefinitely until the lower manual or pedals are played, sending lower manual Legato (J61-4) or pedal down (J62- 3) signals to the other input of Touch Start gate (IC 23a), which forces its output 'Hi' (Gnd) and, providing foot switch isn't depressed, will enable the pattern enable gate.

E. Pattern/Break Strobe

The pattern enable signal, actually $\overline{\text{pattern enable}}$, is used throughout the Rhythm Unit. One important function of this signal is to activate and select the 460 (IC 1) and 462 (IC 2) generator chips. The 460 and 462 outputs are inactive until they receive clock pulses at their respective strobe inputs. The clock [IC 3, Pin 11] is brought to two output gates (IC 14c d) and deglitched with an R-C filter. These gates drive the strobe inputs of the 460 and 462. The activation of one of these gates, and so the activation of either the 460 or 462, is determined by the state of the pattern/break select Flip-Flop (IC 17b) and pattern enable. The power up reset pulse automatically resets the Pattern/Break select F-F into the pattern active mode. Only the presence of Pattern Enable at the control logic (IC 16a, b, d) is necessary for the strobe pulses to be sent to the 460. The reset line of the F-F (IC 17b) is also automatically pulsed, with every transition from sound to silent of the Sound/Sound pad, by the Pattern Enable line capacitively coupled to one input of the F-F reset gate (IC 18a).

To enter break active mode, the break touch pad line must be brought to ground. Either by activating the touch pad or by choosing and activating the break function of the pro-foot switch. This signal sets the Pattern/Break F-F through inverting and controlling gates (IC 20a, d). A control line, break disable, into these gates prevents a break from occuring while any pattern which has no associated drum break is selected. These patterns are Waltz, March 6/8, Blues Rock and Liverpool. The Pattern Break F-F can be put into the break state while the unit is in either Silent or Sound mode. If in the Silent mode, and the break pad is struck when the unit is cycled into sound a full two-measure drum break will play (provided a pattern with an assigned break is selected). At the end of the programmed drum break, a pulse comes out at the break reset line of the 462 to the clock input of the Pattern/Break F-F. This toggles the and routes the strobe back to the 460 and the drum pattern resumes (starting on the first beat of the first measure). If a break is triggered while the unit is playing (in Sound mode) the 462 is strobed for the remaining portion of the two-measure cycle. At the end of which the break reset pulse will revert the strobe back to the 460.

The Pattern/Break F-F also is used to enable gates (IC 21a, b) controlling the keying of the sandblock voices. The control signals are taken from the outputs of NOR gates, IC 16a, d. These gates (IC 21a b) are necessary because sandblock is sometimes used as a sustained voice and therefore isn't strobed internally (inside the 460 and 462) like the other voices.

III. RHYTHM GENERATORS

A. 460/462/450 (And Interface)

The circuitry discussed to this point has all been control logic necessary to operate the 460 (IC 1), 462 (IC 2) and 450 (IC 3). These three IC's are, respectively, the source of pattern and variation clock information, break information, and voicing and tempo clock information. They are tied together by a common clock (450 generated) and reset line to ensure each chip stays in sync (beat) with the others.

The 450 generates the basic tempo clock for the Rhythm Unit either from the setting of the tempo pot located on the front panel or, when in Touch-Tempo mode, from the rate with which the SILENT/SOUND touch pad is tapped. In this mode, a time measuring circuit, internal to the 450, is enabled with one tap of the SILENT/SOUND pad. The second tap initiates the counting circuitry. It is this period between the second and third taps that determines tempo frequency. The third tap will stop the counter and the fourth (and Final) tap causes a 'Hi' (Gnd) output at the 450's run line [IC 3, Pin 14] putting the unit into sound mode. One more tap will cause the run and stop lines to toggle back putting the unit in silent mode. If the unit is not in Touch-Tempo mode each tap of the touch pad will have no effect on the run and stop lines.

At the 460 the tempo clock, besides clocking through the selected pattern, is divided down to derive the variation clocks (Z1:J52- 9, Y1: J52- 8, X5:J52- 7, X4:J52- 6, X3:J52- 5). This information is selectively sent back to the 450 [IC 3, Pin 19] through a five position switch (J52, 2) located on the control panel, to the variation clock input. With the Auto Vari input (Pin 18) of the 450 grounded, this signal will control the rate with which the unit cycles through variations. The Auto Vari switching logic (IC 22, Q23-26) displays which variation the unit is in at any given time. This information comes from (Bi-directional) variation lines A, B, C, D on the 450. These lines, though normally outputs, become inputs when the external input line [450, Pin 23] is pulled to ground. This signal is provided by the external input switch (IC 23c, Q27) whenever a variation switch is depressed. If the program line [450, Pin 22] is pulled to ground and Auto Vari is not, each manual selection of a variation, through use of the variation switches, will be stored internal to this 450 (up to 16 selections may be stored). Pulling the Auto Vari line to ground (leaving program grounded) now will cause the unit to cycle through the stored series of variations rather than the conventional A-B-C-D. The chip automatically selects A-B-C-D when program mode is not selected or if it is selected and no variation cycle is manually inputed.

Although the 450 chip has all the control over selection and display of variation information, this information must be encoded and sent to the 460 via lines Y2 and Y3 in order that the correct pattern variation score is played.

The 462 needs no variation information as the break patterns do not change for different variations.

A. 460/462/450 (And Interface) (Cont'd)

The voice outputs of the 460 (IC 1) and 462 (IC 2) are internally gated so that their outputs can be tied directly together (with the exception of sandblock whose special case has already been described). These voice lines each drive an R-C Time Constant with inverters (IC 13b-f) and NAND gates (IC 12, IC 21a, b) providing the necessary logic inversion to the pulses out of the 460 and 462. Three NAND gates (IC 11b, c, d) are diode OR'd with the outputs of the Snare, Cymbal and Bass Drum gates (IC 12a, b, c) to share these voices time constants. The gates (IC 11b, c, d) along with the lower manual brush gate (IC 11a), which has its own time constant, are used to trigger the 'Follow the Player' voices which are available (when selected) on the lower manual and pedal. The inputs to these gates (IC 11) are provided by the four front panel switches (each enabling one voice) and by the Lower Manual legato and pedal down signals from the organ. The lower manual legato and pedal down signals must be routed through 'One-Shots' (IC 16c, IC 20c) to ensure that the time constants are keyed by pulses which are uniform in length. The pattern enable signal disables the lower manual and pedal voices when the Rhythm Unit is activated.

As a rhythm or break pattern progresses (or a lower manual or pedal voice is keyed) the 460 or 462 outputs a short positive going pulse at the proper voice output (Snare, Claves, etc.) as each voice is called for in the patterns score (or selected by the 'Follow the Player' controls). These pulses key the logic invertors and time constants and create a waveform with a percussion envelope. This waveform is used to key the 450 voicing chip (IC 3). This causes a signal with the proper frequency information [determined by the R-C combination of C40 and R184] and envelope (created by the T-C's) to appear at one of the five output groups [IC 3, Pins 33-37]. The output waveforms are square waves or combinations of square waves, except in the case of Bass Drum which is a stairstep signal, and so all require audio filtering.

IV. AUDIO (AND AUDIO CONTROL)

A. Filters

Although each voice is individually keyed at the 450, the outputs from the 450 are arranged into five groups (each containing from one to four voices). They are grouped with respect to frequency so that individual filters are not necessary for each voice.

All groups utilize active, two pole filters (with gain or a seperate gain stage) realized with standard 324 quad op-amps (all biased around 7V). The first filter is a cascaded Lo-Pass configuration utilizing three stages of two pole filters. The first two stages have gain, the third does not. This filter block processes four signals: Bass Drum, Conga, Bango, Snare Drum I (Lo-Frequency component of SD). The second is also a cascaded Lo-Pass arrangement but with only two stages (each with gain) and a Lo-Frequency roll-off provided by coupling capacitor [C58]. This filter block, labeled Medium pass, processes both components (two square waves differing in amplitude and frequency) of cowbell, the Lo-Frequency component of Rimshot (I) and Claves. The third filter is made up of two Hi-Pass selections (both with gain). The Hi-Pass filter block handles sandblock, brush, and the Hi-Frequency components of Snare Drum and Rimshot. The two remaining filter blocks are single stage bandpass filter. Each with a separate pre-amplification gain stage as the filters themselves have unity gain. They are distinguished from each other by the labels Hi (Band Pass) and Lo (Band Pass) and the choice of center frequency determining resistors and capacitors. The Hi Band Pass filter only serves the lower manual brush voice while the Lo Band Pass serves the two components of the Cymbal voice.

B. Output Stages

The filter outputs are mixed into two output lines, Lo and Hi. The Lo Pass and Medium Pass filter are mixed to create the Lo-Out line and the remaining filter blocks are mixed to create the Hi-Out line. These audio lines are each sent to one-half of a 3280 dual-voltage controlled amplifier (IC 35) whose maximum gain is controlled by a variable load resistance at the output pins [Pins 12, 13]. The signals are direct coupled to emitter-follower stages (Q30, 31) to lower output impedances and then capacitively coupled out to the organ amplifier stages (J64- 6, 7).

C. Fade

The main volume control (J57- 1, 2, J50- 8) controls both Lo and Hi outputs at the VCA (IC 35) with D-C control of the V-Control inputs [Pins 3, 6]. The volume control is fed by another Op-Amp (IC 31a wired for unity gain. At the input of this Op-Amp is a very slow time constant [R304, C86] driven by a Flip-Flop (IC 33b). When the F-F is set, the volume control has full range capability because the Op-Amp's output (IC 31a) [Pin 1] is at ground potential.

The F-F will be automatically set every time the Rhythm Unit is cycled into Silent mode by the sound line from Silent/Sound F-F (IC 25b). This ensures that fade is inactive till the unit is put into the Sound mode. If in the Sound mode, closing either the fade switch on the front panel (J56- 1) or the fade switch on Pro-Foot (J64-9) will cause the F-F to toggle (these switches are made bounceless by IC 34c, [R308, C87]). If the F-F is set (normal condition) when either switch is temporarily closed, the Rhythm Unit's volume will fade, at a rate determined by the T-C [R304, C86], to silence. This condition will exist until a fade switch is activated again (toggleing the F-F into the opposite state) or until a Sound/Silent cycle is performed (setting the F-F as previously described).

D. Touch Switches

The purpose of the touch switch circuitry is to interface the Silent/Sound and Break Touch Pads, on the front panel, to the previously described control logic. The circuit is basically made up of three comparators (IC 29), one acting as a touch pad driver (for both pads) the others as individual detectors for the Silent/Sound and Break pads.

The touch pad driver is an ultra-sonic oscillator [frequency determined by C79 and R274] capacitively coupled to the shield of a length of shielded cable (J57- 5, 6). The center lead of the shield is tied at one end to the touch pad itself and at its other end to the touch detector circuitry (J57- 3, 4). The purpose of this cable is to couple the driver signal to the touch detector and pad through the capacitance between shield and center conductor. This signal is rectified and coupled to the inverting input of the comparator. The comparators inputs are biased by resistor dividers such that its output is at -14V as long as the driver signal is allowed to pass through to the detector. If the touch pad is tapped (i.e., with one's finger tips) the driver signal is attenuated to ground by the operators physical presence. This upsets the bias of the detector's comparator and causes its output to pulse to ground. This signal is used to activate Silent/Sound (IC 25b) and Break (IC 17b) Flip-Flops.

V. E.O.P. LOGIC

A. E.O.P. Control

The E.O.P. output gate (IC 24a) is controled by the state of four control lines, any of which can put the E.O.P. signal (J63- 4, 5) into the off state by driving an input to -14V.

The first line is the Autochord switch (front panel: J55- 5) this must be closed for E.O.P. to be active. Second, a line from the break F-F (IC 17b) kills E.O.P. during a break. Third, the pattern enable signal holds E.O.P. off unless the Rhythm Unit is active. Fourth and lastly, a line from the Silent/Sound F-F (IC 25b) required the unit to be in Sound mode for E.O.P. to exist.

The chord chop signal (J62, 1, 4) is dependent on the state of E.O.P. and the sustain chord switch. If either of these inputs switches to ground, the chord chop gate (IC 26a) turns the chord chop signal off (-14V).

B. Autochord Snubbing

This block provides the accompaniment pulses and the chord snubbing signals. Accompaniment pulses are generated by the 460 to match each rhythm pattern. The accompaniment signal is gated on or off by the pattern enable line. The output of the gate (IC 21d) is fed through a glitch filter [R154, C37] and inverter (IC 21c) and brought out to the organ (J62- 7). The chord snubbing signal (J61- 1) goes to -14V only when all inputs to one of the two control gates (IC 18a, c) are at ground level. Therefore, if chord chop is off (-14V) no snubbing can occur. Assuming chord chop active, a snub output only can occur when Flip-Flop (IC 19a, b) are in opposite states.

For some rhythm patterns, it is aesthetically advantageous to not have the accompaniment chord snubbed when it is concurrent with the Bass Drum voice. Therefore, if a pattern such as this is selected (i.e., Tango, Disco, etc.), no snub pulse can occur when a Bass Drum pulse [IC 1, IC 2, Pin 28] is coincident with an accompaniment pulse, [IC 1, Pin 39], because both F-F's will be set (identical states). A snub will occur in all other cases with each Autochord pulse.

For the other Rhythm Patterns just the opposite hold true. A snub is desired only when a Bass Drum pulse is concurrent with an accompaniment pulse. So every concurrence of Bass Drum and accompaniment causes the Flip-Flop to enter opposite states (IC 19b set, IC 19a, reset).

(649) AUTO VARI 64 ACCESSORY POWER SUPPLY 124-000649

AC line voltage is routed to power transformer through power switch S1. The multiple connections at J7 allow for alternate line voltages to be used simply by appropriate wiring of the transformer primary leads. The purpose of C4 is to minimize transients generated by operating the switch. The secondary voltage is fused by F1 and F2 with the center tap at ground. This voltage is rectified by D1 and D2 then filtered by C1 and R1. IC 1 is a voltage regulator which maintains the supply at -15V. Additional filtering is provided by C2. To reduce turn-on pop, a "Slo Down" circuit consisting of time constant R3 and C3 drives the base of Darlington transistor Q1, connected as an emitter-follower provides audio supply voltage. Resistors R2 and R4 will limit current in case supply is temporarily shorted.

(656) AUTO VARI 64 ACCESSORY POWER SUPPLY 124-000656

This PWB assembly is used in export units. Refer to 124-000649 theory for circuit explanation.

SECTION III
DISASSEMBLY PROCEDURE

MODEL: 101100

TO REMOVE BOTTOM PANEL:

1) Disconnect unit from A.C. line voltage source.

2) Turn unit over, resting top of case on soft carpet like surface to avoid scratching or marring of finish.

3) Remove four screws from bottom panel and lift away.

TO REMOVE CHASSIS ASSEMBLY:

1) Follow steps to remove botton panel.

2) With firm steady pressure, pull Volume, Tempo and Measure knobs from control panel, similarly remove slide switch knob.

3) Remove three 1/4" hex head screws, on each side, holding chassis assembly to brackets mounted in case.

4) Slide chassis slightly to the rear, giving access to the three indicator lights (LED).

5) From rear of control panel, carefully slide black plastic collars back onto the diode leads.

6) From front of control panel, push back on lights and loosen lamps and leads from control panel.

7) Lights are now clear and chassis is free to lift out.

TO REMOVE PATTERN GENERATOR PWB (124--000379):

1) Follow steps to remove chassis assembly.

2) Unplug edge connectors from board.

3) Remove the plastic frame around rhythm buttons by a steady pull at each end.

4) With escutcheon removed, locate small hex head screw at each end of push-button bracket, remove screws.

5) Release spring clips holding board and lift out.

TO REMOVE VOICING PWB (124-000426):

1) Follow steps to remove chassis assembly.

2) Unplug edge connector from board.

3) Release four spring clips and slide board slightly to the right just enough to give clearance of chassis lip.

4) Lift up and to the left to remove board.

TO REMOVE VARIATION PWB (124-000418):

1) Follow steps to remove chassis assembly.

2) Unplug edge connector from board.

3) Turn chassis over and remove three hex head screws, (from top side of chassis) holding Variation PWB and push-buttons to chassis.

4) Release spring clips and lift board out.

NOTE: Variation buttons can be removed by pulling forward and off. By removing two slot head screws plastic escutcheon can be removed, leaving switches and PWB as an assembly.

TO REMOVE CONTROL PANEL:

1) Follow steps to remove chassis assembly.

2) Remove three hex head screws (each side) which hold mounting brackets and control panel to case.

3) Remove two hex head screws (each end) holding panel to brackets.

TO REMOVE BACK PANEL:

1) Follow steps to remove bottom panel.

2) Remove three hex head screws mounting metal back panel to chassis assembly.

NOTE: Care should be taken not to lose spacers used between back panel and chassis assembly.

MODEL: 101300

TO REMOVE BOTTON PANEL:

1) Disconnect unit from A.C. line voltage source.

2) Turn unit over, resting top of case on soft carpet like surface to avoid scratching or marring of finish.

3) Remove five phillips head screws from bottom panel, as shown in Figure A, Number 1.

4) Gently lift botton panel up and away.

TO REMOVE CHASSIS AND CONTROL PANEL ASSEMBLY:

1) Follow steps to remove botton panel.

2) Remove four hex head screws that secure assembly to case, as shown in Figure A, Number 2.

3) Gently slide back and lift out chassis assembly.

NOTE: In performing this operation you will encounter resistance from the A.C. power cable. Care should be taken to avoid damage to the cord.

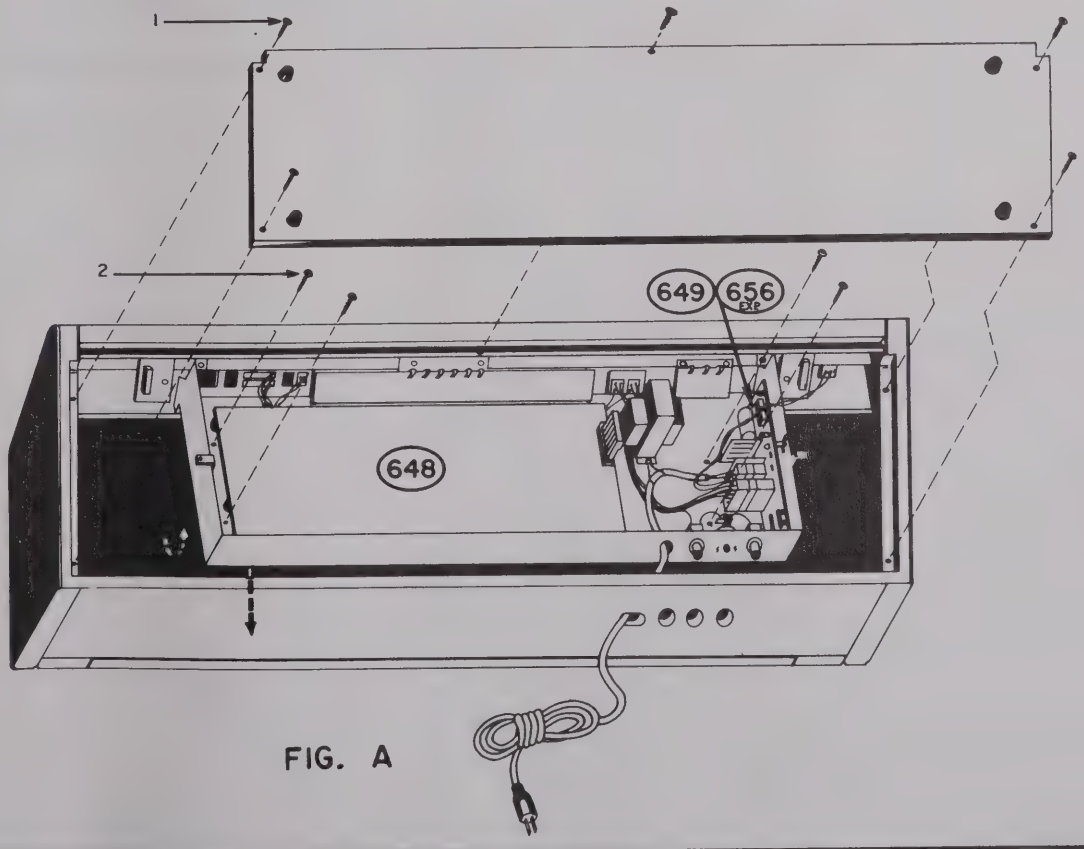


FIG. A

SECTION IV
TEST AND ADJUSTMENT PROCEDURE

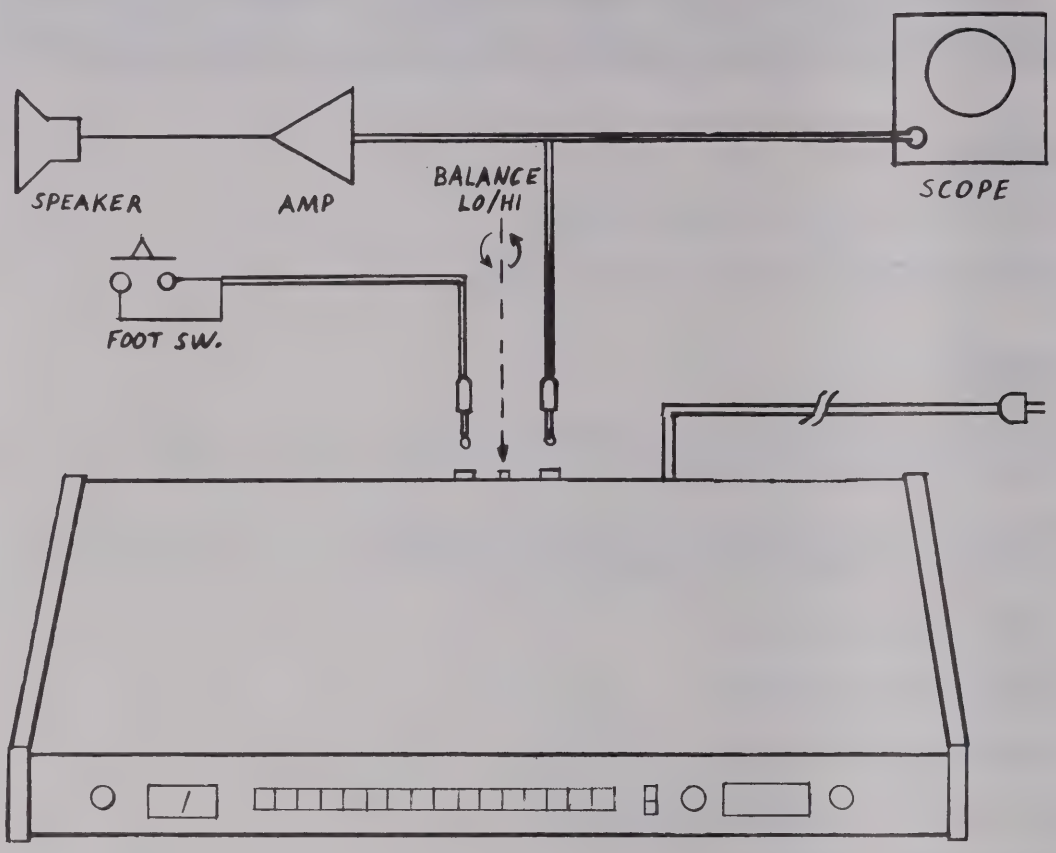
TEST EQUIPMENT

1. Oscilloscope Tek 561 or equivalent.
2. Power Amplifier and Wide Range Speaker.

TEST CONDITIONS

The following conditions, unless otherwise stated, are to be maintained during the Test and Adjustment Procedure:

1. The input line voltage shall be set at 120 VAC = 4 VAC (or 220 VAC = 4 VAC or 240 VAC = 4 VAC when appropriate).
2. VOLUME control maximum.
3. TEMPO to mid-position.
4. MEASURE at position 2.
5. AUTO VARI and PROGRAM (101300) off.
6. TOUCH TEMPO (101300) off.
7. BALANCE control in center detent position.
8. Power on.



101100

REFER TO THE ABOVE TEST SET-UP DIAGRAM FOR EQUIPMENT CONNECTIONS.

REFER TO APPROPRIATE PWB LAYOUT IN SECTION V FOR POT LOCATIONS.

TEST AND ADJUSTMENT PROCEDURE

MODEL 101100

STEP	TITLE OF TEST	SETUP PROCEDURE (TABS DEPRESSED) (TONEBARS OUT)	KEY(S) DEPRESSED	SCALE & TYPE OF TEST EQUIP.	TEST POINT	POT AND BOARD	SPECIFICATION AND/OR ACCEPTABLE CONDITION
1	High Freq. Adjust	WALTZ SILENT/SOUND (Adjust R 127 Lo Freq. for min. Bass Drum output)		Scope 1v/div	Output Jack	R 121 Hi Freq. (380)	Set white noise component of Snare Drum, on beat 2 for 2.8 VP-P
2	Low Freq. Adjust	WALTZ SILENT/SOUND VARIATION A		Scope 1v/div	Output Jack	R 127 Lo Freq. (380)	Set Bass Drum output on beat 1 for 2.4 VP-P

THE FOLLOWING STEPS ARE VISUAL AND LISTENING TESTS
(Monitor by using external amplifier and speaker).

3. Auto Vari

a) Depress the four VARIATION push-buttons, one at a time, and note that as each button is depressed, it will light and turn OFF the button that was lighted.

b) Depress the WALTZ rhythm button, VARIATION "A" button, and set the SILENT/SOUND rocker to SOUND.

c) Note the simple WALTZ pattern sounding. Now depress VARIATION buttons B, C and D in order and note that the WALTZ pattern becomes more complicated as each button is depressed.

d) Depress VARIATION "B" button, set the SILENT/SOUND rocker to SILENT, move the AUTO VARI slide switch to ON, set the MEASURE switch to 1/2, and depress the WESTERN button.

e) Set the SILENT/SOUND rocker to SOUND and note that rhythm will sound and that VARIATION "A" lamp will light at the same time.

f) Note that for every two flashes of TEMPO a different VARIATION lamp will light, in an A, B, C, D and the A sequence.

g) Verify the MEASURE rates according to the following table:

MEASURE RATE	COMPARISON (TEMPO POT MAX.)
1/2	A variation change for every 2 tempo flashes
1	A variation change for each measure lamp change
2	A variation change for every 2 measure lamp changes
4	A variation change for every 4 measure lamp changes
8	A variation change for every 8 measure lamp changes
16	A variation change for every 16 measure lamp changes

h) Move the AUTO VARI switch to the OFF position and note that the VARIATION lamps will stop changing automatically.

i) Set the SILENT/SOUND rocker to SILENT and depress VARIATION "A" push-button.

4. Rhythm Voices

a) Depress the following Rhythm buttons and VARIATION buttons. Set the SILENT/SOUND rocker to SOUND. Listen for proper compliment of rhythm voices as indicated in chart below.

RHYTHM PATTERN	VARIATION	VOICES
POLKA MARCH	B	Bass Drum, Cymbal, Conga, Drum Roll, Brush, Rim shot, Cow Bell
DIXIELAND	D	Bass Drum, Cymbal, Bango, Conga, Snare, Cow Bell
JAZZ	C	Bass Drum, Cymbal, Snare, Rim Shot
CHA-CHA	D	Bass Drum, Cymbal, Bango, Conga, Clave, Snare, Sand Block, Rim Shot, Brush

NOTE: This test is performed to ensure that all 11 automatic rhythm voices are sounding.

b) Depress VARIATION "A" push-button and all 16 rhythm buttons, one at a time. Note that the rhythm unit will sound when each rhythm button is depressed.

c) Depress JAZZ rhythm button, VARIATION "A" push-button and set SILENT/SOUND rocker to SILENT.

5. Tempo Control

a) Set the SILENT/SOUND rocker to SOUND, rotate the TEMPO control, and note that the TEMPO varies smoothly from a very slow rate of 12 measures per minute to a very fast rate of 75 measures per minute.

6. Volume Control

a) Rotate the VOLUME control from minimum to maximum and note the smooth increase in level as the control is rotated clockwise. The rhythm unit will be silenced when the control is in the maximum counterclockwise position.

7. Foot Switch

a) Depress any rhythm button and any VARIATION. Set the SILENT/SOUND rocker to SOUND.

b) Momentarily depress the FOOT SWITCH and note that the rhythm unit will be silenced. When the FOOT SWITCH is released, note that the rhythm unit starts sounding with beat 1 of measure 1.

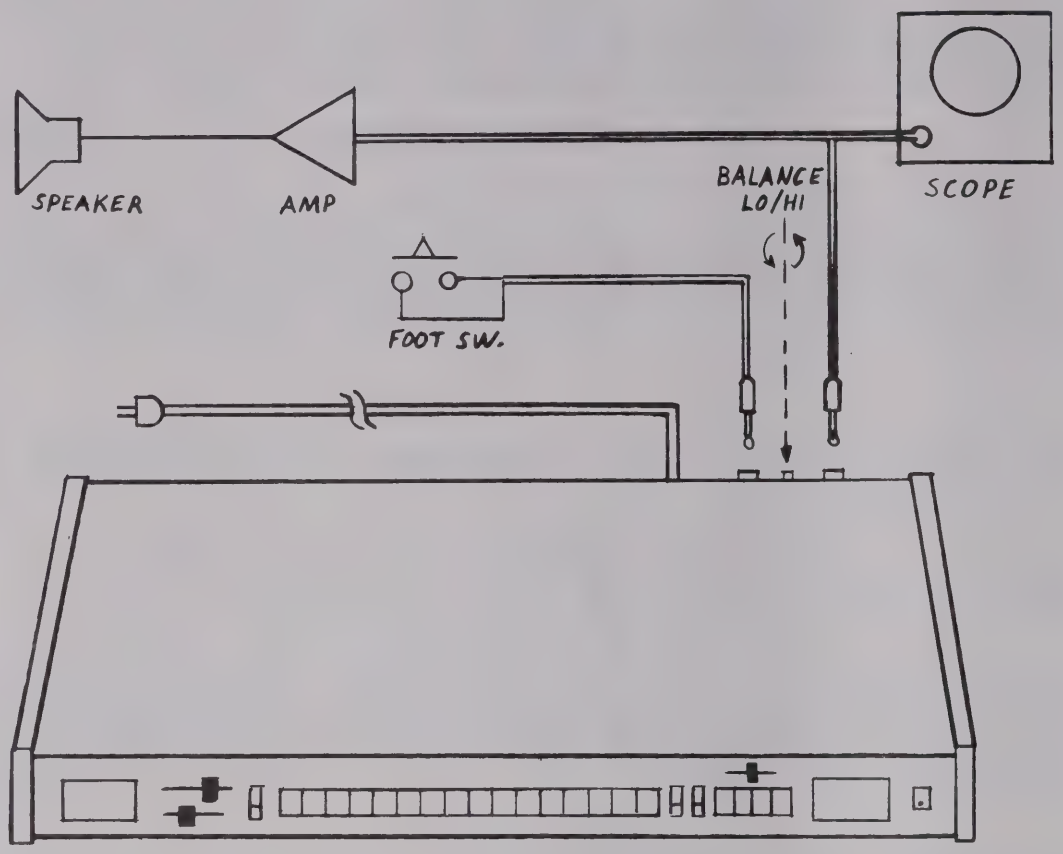
c) Set the AUTO VARI switch to "ON" and depress the FOOT SWITCH when either VARIATION "B" or "C" is lighted. Release the FOOT SWITCH and note that the rhythm unit will start as in the previous step and that VARIATION "A" shall light.

8. Balance Control

a) Depress any rhythm button and set the SILENT/SOUND rocker to the SOUND position.

b) Rotate the BALANCE control (with a screwdriver) from one extreme to the other. Note that at one end virtually all high frequency voices have disappeared and at the other end virtually all low frequency voices have disappeared. NOTE: In each case the voices being cancelled out should never totally disappear but should be greatly reduced in volume.

c) Return the BALANCE control to the center detent position and note the balance of high and low frequencies.



101300

REFER TO THE ABOVE TEST SET-UP DIAGRAM FOR EQUIPMENT CONNECTIONS.

REFER TO APPROPRIATE PWB LAYOUT IN SECTION V FOR POT LOCATIONS.

STEP	TITLE OF TEST	SETUP PROCEDURE (TABS DEPRESSED) (TONEBARS OUT)	KEY(S) DEPRESSED	SCALE & TYPE OF TEST EQUIP.	TEST POINT	POT AND BOARD	SPECIFICATION AND/OR ACCEPTABLE CONDITION
1	High Freq. Adjust	WALTZ SILENT/SOUND VARIATION A (Adjust R 293 Low Freq. for min. Bass Drum output)		Scope 05v/div	Output Jack	R 300 High Freq. (648)	Set white noise component of Snare Drum on beat 2 for 1.0 VP-P
2	Low Freq. Adjust	WALTZ SILENT/SOUND VARIATION A		Scope 0.5v/div	Output Jack	R 293 Low Freq. (648)	Set Bass Drum output on beat 1 for 1.5 VP-P

THE FOLLOWING STEPS ARE VISUAL AND LISTENING TESTS
(Monitor by using external amplifier and speaker).

3. Auto Vari

Follow steps 3a thru 3i previously described for Model 101100, then proceed with step 3j below. NOTE: SILENT/SOUND is now a touch pad.

j) Move the PROGRAM SWITCH to the ON position (up) and depress the VARIATION switches in reverse order: D, C, B and A. Set MEASURE rate to position 2.

k) Move the AUTO VARI switch to the ON position and tap the SILENT/SOUND pad into SOUND mode. Observe the VARIATION lamps changing in a D, C, B, A, D.....etc., sequence. Move AUTO VARI and PROGRAM switches to OFF position.

l) Tap the SILENT/SOUND pad to SILENT and depress VARIATION "A" switch.

4. Rhythm Voices

Follow step 4a previously described for Model 101100, then proceed with step 4b below.

b) Depress VARIATION switch "A" and all sixteen rhythm pattern switches sequentially. Note that the Rhythm Unit sounds as each switch is closed. The lamp should remain lit until the next pattern is selected. Tap the SILENT/SOUND pad into SILENT mode.

c) Depress six rhythm switches simultaneously and observe that all lamps (VARIATIONS, PATTERNS, TEMPO) go out, with the exception of the SILENT/SOUND indicators. Depress the "WALTZ" pattern switch, lamps and indicators should relight.

d) Depress the Lamp Cancel Switch on the Break pad bezel. Once again all lamps should go out. Depress the "WALTZ" pattern switch, lights will return, depress VARIATION "A" switch.

5. Tempo and Touch-Tempo Control

a) Tap the SILENT/SOUND pad into SOUND, slide the TEMPO Control and note that the tempo varies smoothly from a very slow rate (13.5 measures per minute) to a very fast rate (106.5 measures per minute). Leave the unit at the fastest tempo rate.

b) Depress the TOUCH-TEMPO swtich located on the SILENT/SOUND pad bezel. Switch should lock in a depressed position and light. Rhythm Unit will cease to sound and SILENT/SOUND indicator will indicate SILENT mode.

c) Rapidly tap the SILENT/SOUND touch pad four times. The Rhythm Unit should indicate SOUND mode and begin to play on the fourth tap. The tempo should be rapid and equal to the tempo with which you struck the pad.

d) Tap the SILENT/SOUND touch pad once, the unit should now be in SILENT mode.

e) Repeat Step 5c using a slow tempo in tapping the pad. The tempo should be slow when the Rhythm Unit sounds. Depress the TOUCH-TEMPO switch to release the unit from TOUCH-TEMPO mode. The unit should remain in SOUND mode and continue to play. However, the tempo will now be at the fastest rate and control shall be reverted to the tempo pot. Tap the SILENT/SOUND pad into SILENT mode.

6. Volume Control and Fade

a) Rhythm Unit should still be in "WALTZ", VARIATION "A", tap the SILENT/SOUND touch pad into SOUND mode. Slide the VOLUME pot from minimum to maximum and note the smooth increase in level as the control is moved from left to right. In the left most position the unit will be silenced.

b) Move the VOLUME to its maximum position and activate the FADE switch. The unit will begin fading immediately and will take five seconds or greater to be totally silenced.

c) Activating the FADE switch again will return the audio to full volume within two seconds.

d) Once more activate the FADE switch and allow the unit to fade out completely. Tap the SILENT/SOUND switch into SILENT mode and then again into SOUND. The unit should begin sounding at full volume.

7. Foot Switch

Follow steps 7a, b and c previously described for Model 101100.

8. Balance Control

Follow Step 8a, b and c previously described for Model 101100.

9. Break Pad

a) Check Drum Break using the following procedure:

1. Unit is in silent mode any VARIATION.
2. Select pattern: MARCH 4/4.
3. Tap BREAK pad.
4. Put unit into SOUND mode.
5. Note the occurance of a Drum Break followed by the selected rhythm pattern.
6. Put back into SILENT mode.

b) Repeat the procedure in Step 9a for each of the following patterns:

WESTERN, BALLAD, HARD ROCK, DISCO, SAMBA.

c) Observe that WALTZ, 6/8 MARCH, BLUES and LIVERPOOL do not go into a Drum Break when the break pad is struck. Also, observe that these are the only patterns unaffected by Drum Break.

SECTION V
PWB SCHEMATICS AND LAYOUTS

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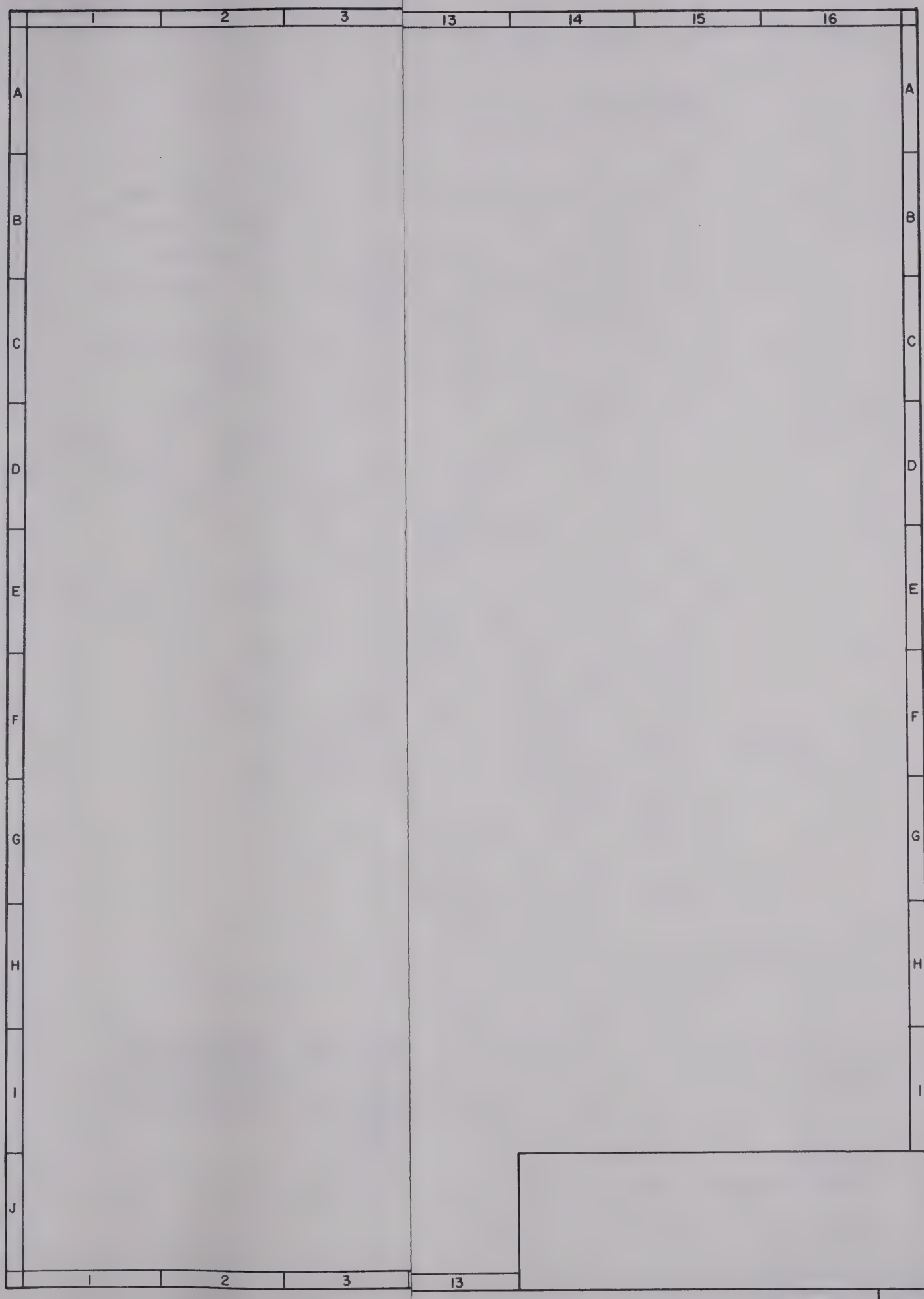
1
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A
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I
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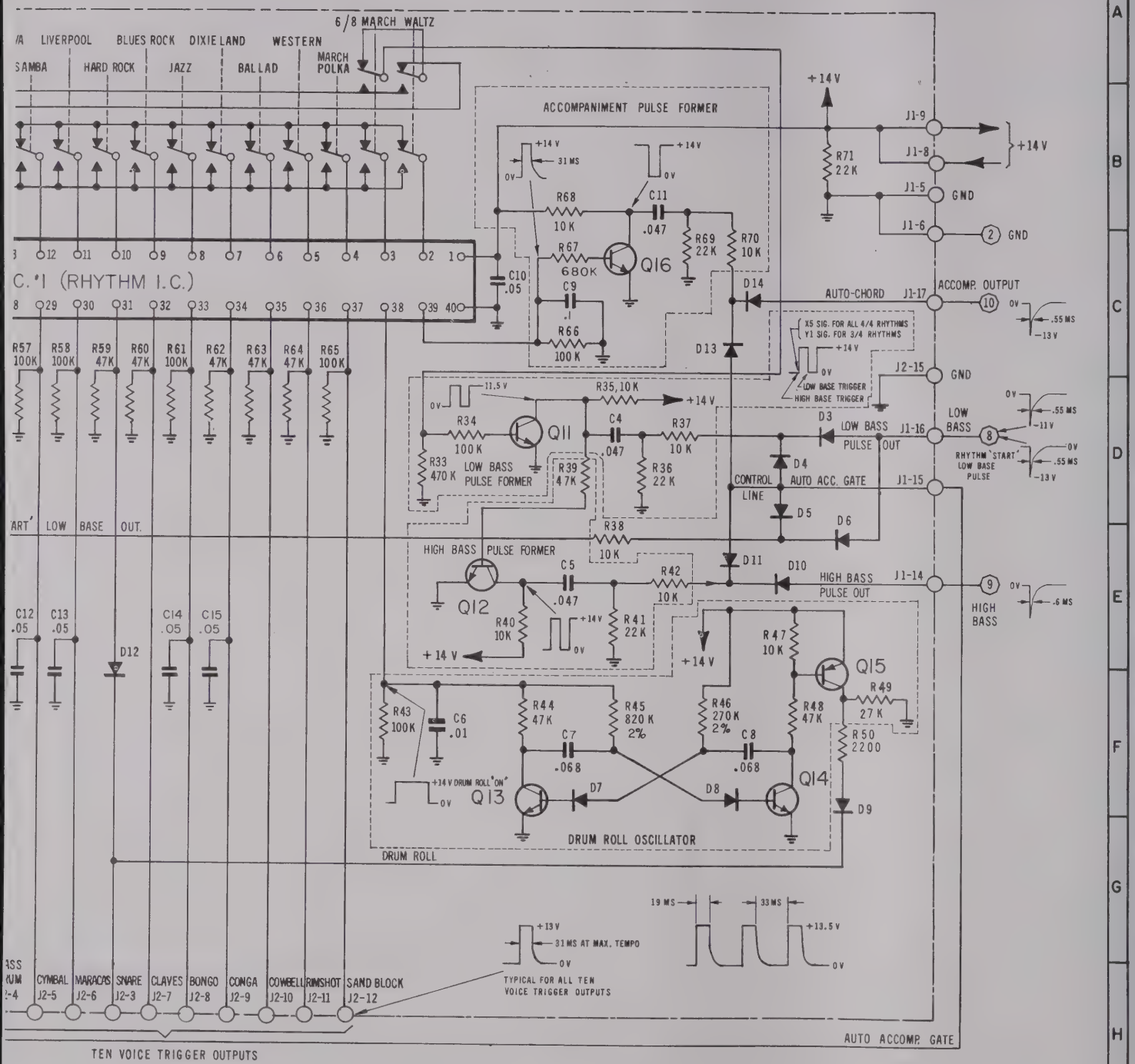


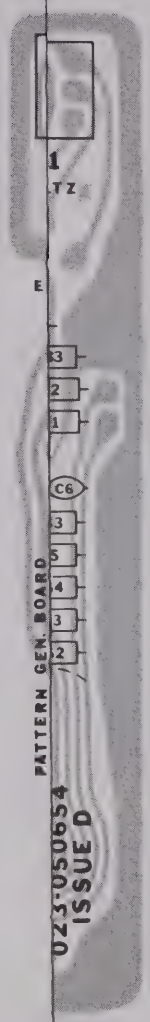
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
1	Q1	001-026050	2N6027
9	Q2 THRU Q6 & Q6, Q11, Q12, Q16, Q17	001-021133	2N3394
3	Q9, Q13, Q14	001-021135	2N3394
4	Q7, Q8, Q10, Q15	001-021172	2N4249
13	D1 & D3 THRU D14	001-026080	1N4148
1	I.C. #1	075-000430	———

124-000379

094-050655-E

REVISIONS			
A	R45 WAS 1 MEG. R72 WAS 47Ω. ADDED: T.P.O., R75, C12 & C13.	G	WAS 10%. R3,5,6,45,46, 76 WERE 5% . ADDED NOTE 5.
B	DELETED N.C. PIN J1-1.	H	ADDED TOUCH TEMPO & EXT. CONN. 13 TO J2-1. R72 WAS 470Ω. R75 2.2K WAS REMOVED.
C	WAVE FORMS, CIRCUIT FUNCTION BOUNDARIES & FUNCTION VOLTAGE NOTATIONS ADDED.	J	ADDED C18 .02 ; R55 WAS 100 K.
D	CONNECTION SHOWN FOR PIN ④		
E	C9 WAS .068; R67 WAS 100K.		
F	C12,13 WERE .01; ADDED C14,15,16,17, D15, R76; R52 WAS 10K.		
G	RESISTOR TOL. IN NOTE 1		

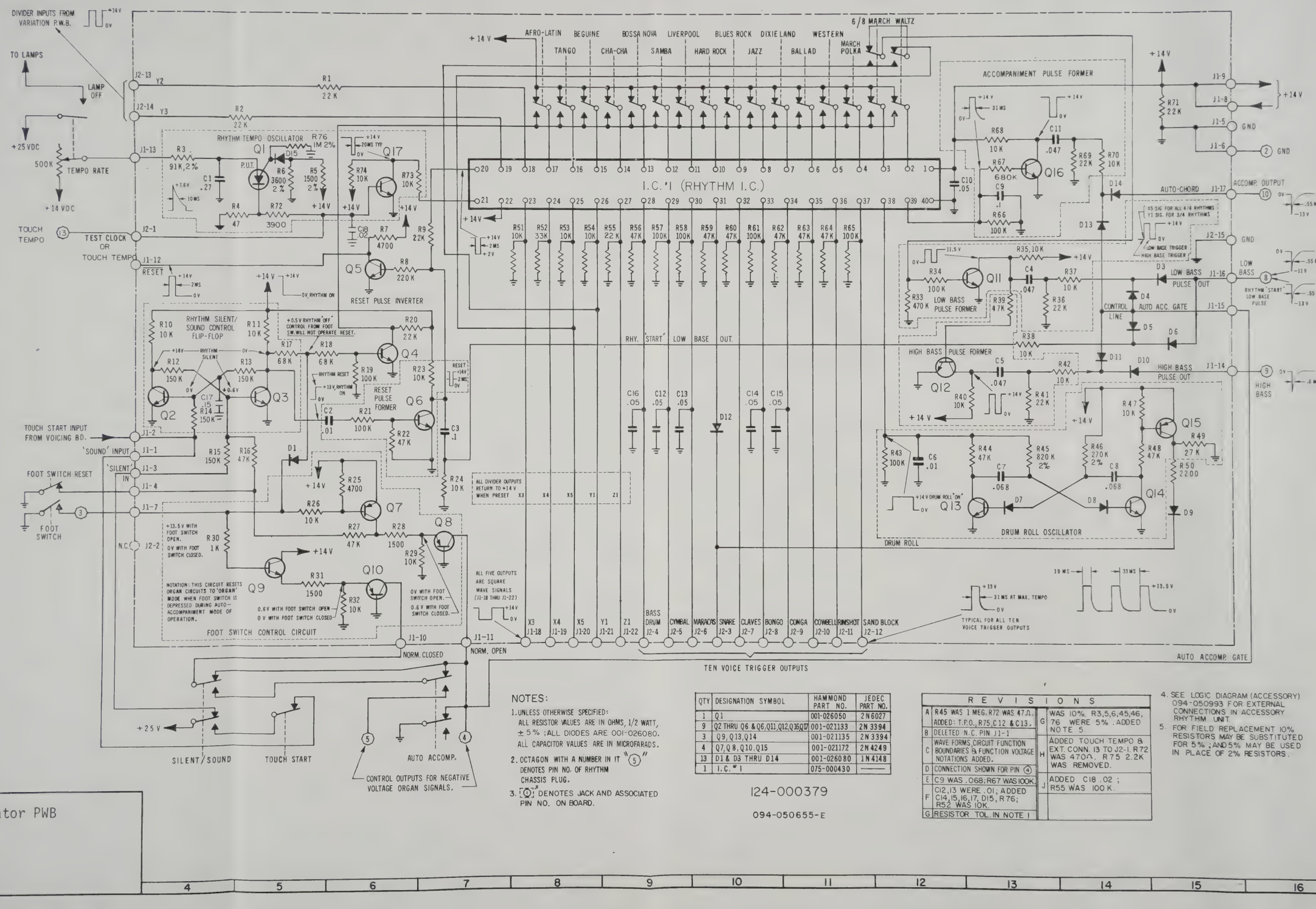
4. SEE LOGIC DIAGRAM (ACCESSORY) 094-050993 FOR EXTERNAL CONNECTIONS IN ACCESSORY RHYTHM UNIT.
5. FOR FIELD REPLACEMENT 10% RESISTORS MAY BE SUBSTITUTED FOR 5% ; AND 5% MAY BE USED IN PLACE OF 2% RESISTORS.



Pattern Generator PWB

Layout

124-000379



NOTES:

1. UNLESS OTHERWISE SPECIFIED: ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 5% ; ALL DIODES ARE 001-026080. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. OCTAGON WITH A NUMBER IN IT "(5)" DENOTES PIN NO. OF RHYTHM CHASSIS PLUG.
3. "[J]" DENOTES JACK AND ASSOCIATED PIN NO. ON BOARD.
4. SEE LOGIC DIAGRAM (ACCESSORY) 094-050993 FOR EXTERNAL CONNECTIONS IN ACCESSORY RHYTHM UNIT.
5. FOR FIELD REPLACEMENT 10% RESISTORS MAY BE SUBSTITUTED FOR 5% ; AND 5% MAY BE USED IN PLACE OF 2% RESISTORS.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
1	Q1	001-026050	2N6027
9	Q2 THRU Q6 & Q8, Q11, Q12, Q16, Q17	001-021133	2N3394
3	Q9, Q13, Q14	001-021135	2N3394
4	Q7, Q8, Q10, Q15	001-021172	2N4249
13	D1 & D3 THRU D14	001-026080	1N4148
1	I.C. #1	075-000430	——

124-000379

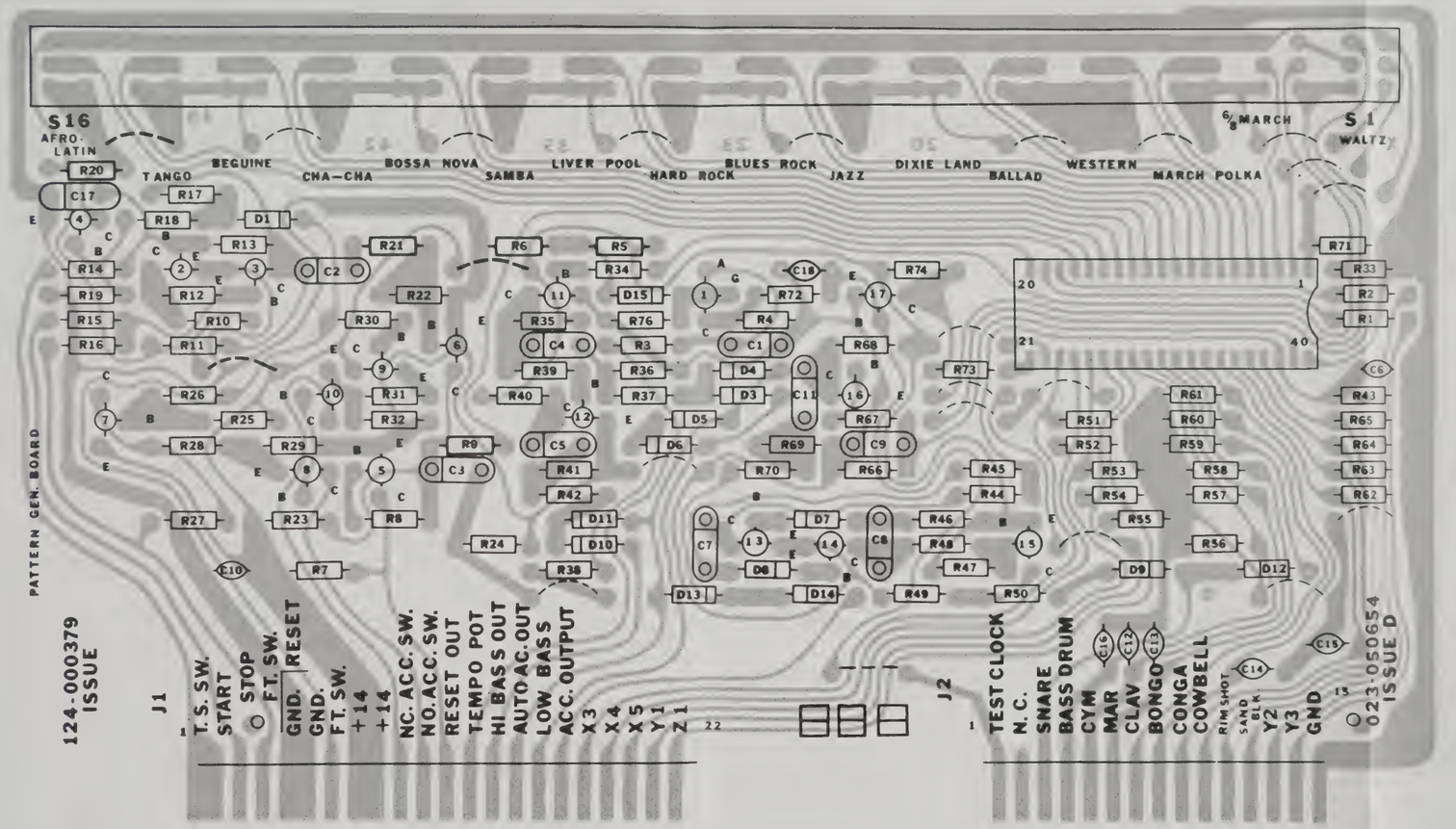
094-050655-E

REVISIONS			
A	R45 WAS 1 MEG. R72 WAS 47Ω. ADDED: T.P.O., R75, C12 & C13.	G	WAS 10%. R3,5,6,45,46, 76 WERE 5%. ADDED NOTE 5.
B	DELETED N.C. PIN J1-1	H	ADDED TOUCH TEMPO & EXT. CONN. 13 TO J2-1. R72 WAS 4700. R75 2.2K WAS REMOVED.
C	WAVE FORMS, CIRCUIT FUNCTION BOUNDARIES & FUNCTION VOLTAGE NOTATIONS ADDED.	J	ADDED C18 .02 ; R55 WAS 100 K.
D	CONNECTION SHOWN FOR PIN (4)		
E	C9 WAS .068; R67 WAS 100K.		
F	C12, 13 WERE .01; ADDED C14, 15, 16, 17, D15, R76; R52 WAS 10K.		
G	RESISTOR TOL. IN NOTE 1		

Pattern Generator PWB

Schematic

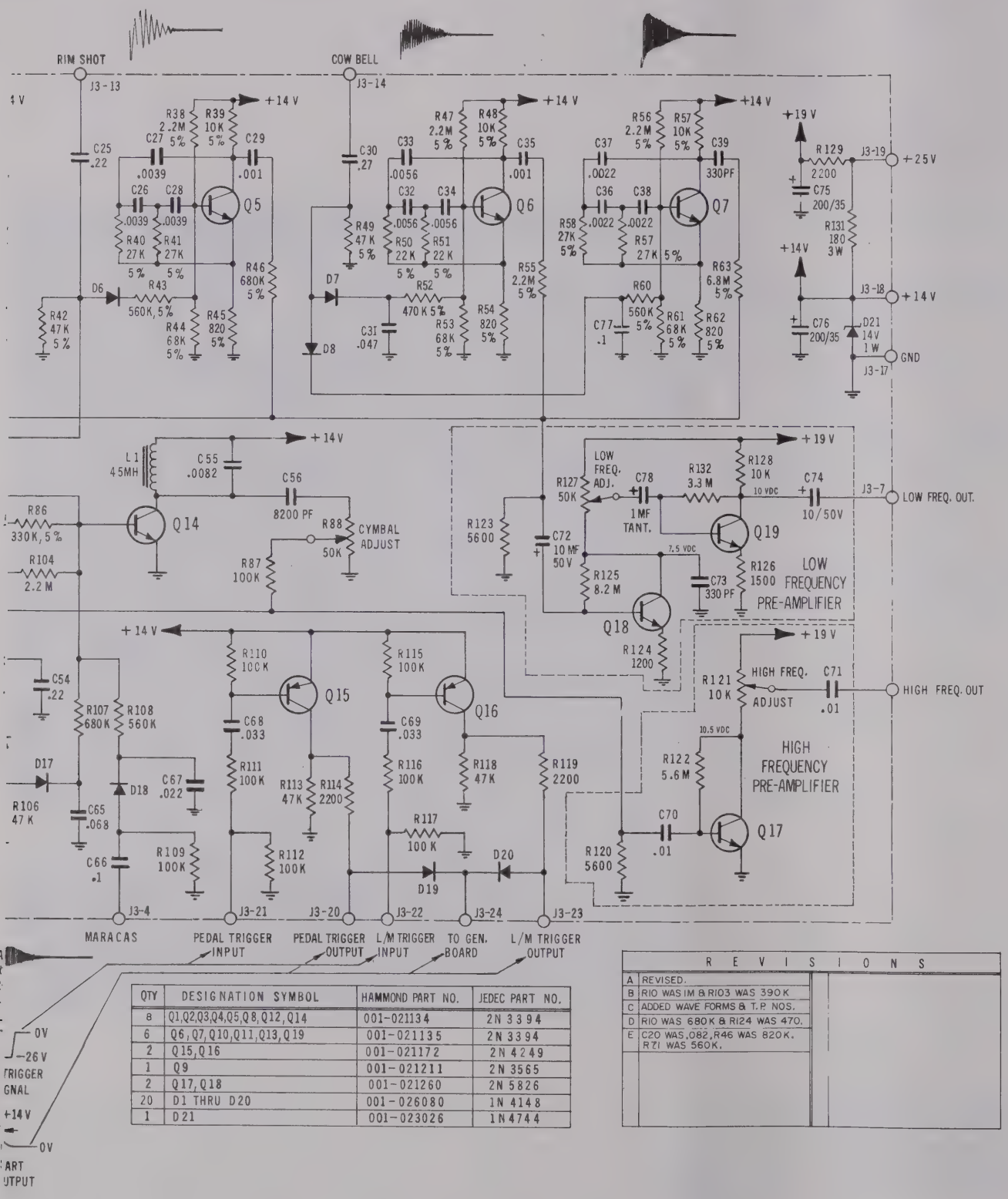
124-000379



Pattern Generator PWB

Layout

124-000379



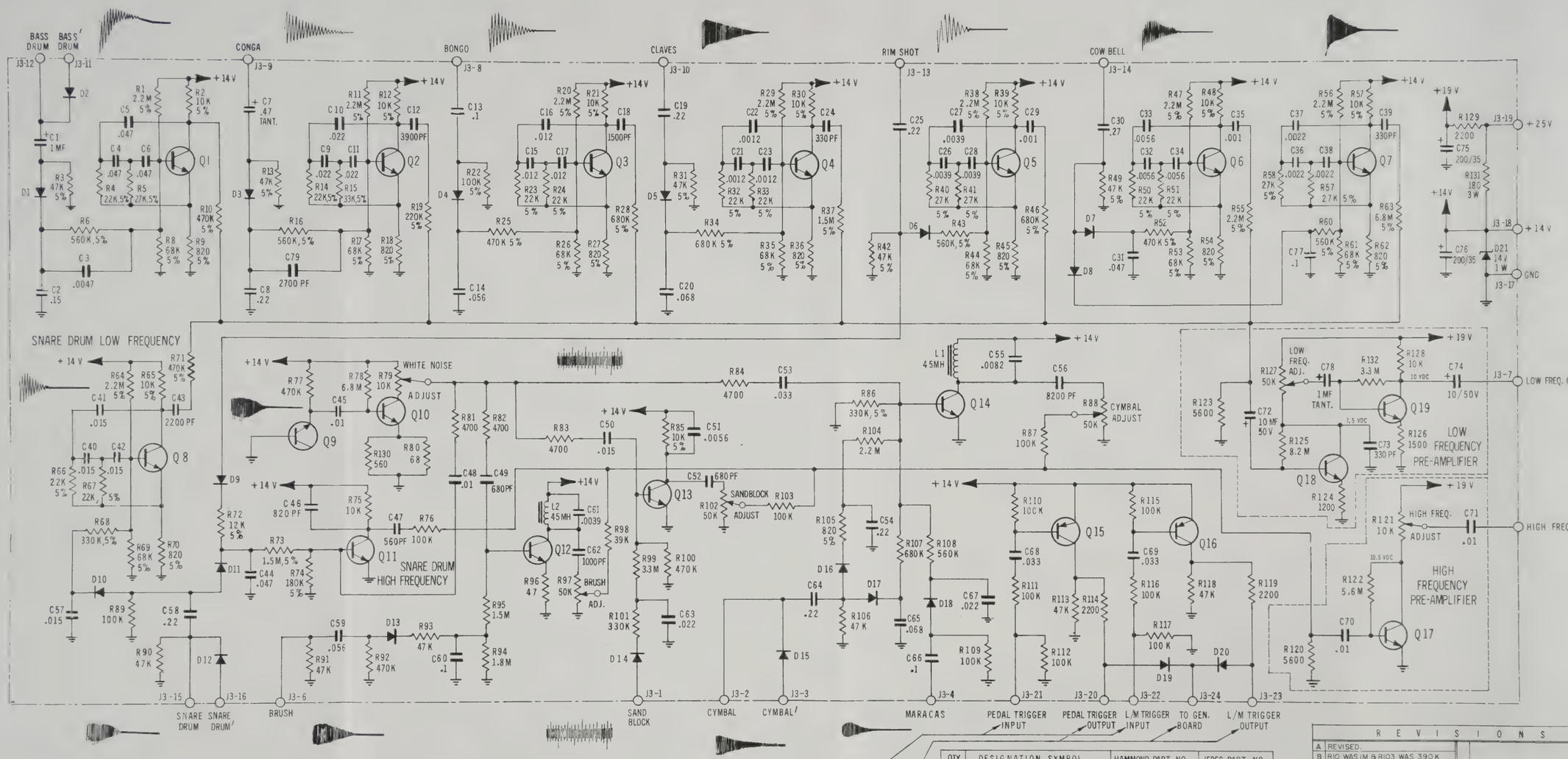
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
8	Q1,Q2,Q3,Q4,Q5,Q8,Q12,Q14	001-021134	2N 3394
6	Q6,Q7,Q10,Q11,Q13,Q19	001-021135	2N 3394
2	Q15,Q16	001-021172	2N 4249
1	Q9	001-021211	2N 3565
2	Q17,Q18	001-021260	2N 5826
20	D1 THRU D20	001-026080	1N 4148
1	D21	001-023026	1N4744

REVISIONS	
A	REVISED.
B	R10 WAS 1M & R103 WAS 390K
C	ADDED WAVE FORMS & T.P. NOS.
D	R10 WAS 680K & R124 WAS 470.
E	C20 WAS .082, R46 WAS 820K. R71 WAS 560K.

Voicing PWB

Layout

124-000380



+13 V
31 MS AT FAST TEMPO
0 V

TYPICAL RHYTHM INPUT PULSE

0V
−26 V

TYPICAL TRIGGER INPUT SIGNAL

12 MS
+14V
0V

TOUCH START TRIGGER OUTPUT

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL —○— INDICATES EDGE CONNECTOR & PIN NUMBER.
3. ALL VOICE WAVE FORMS TAKEN AT PREAMP. OUTPUTS.

124-000380
094-050670-E

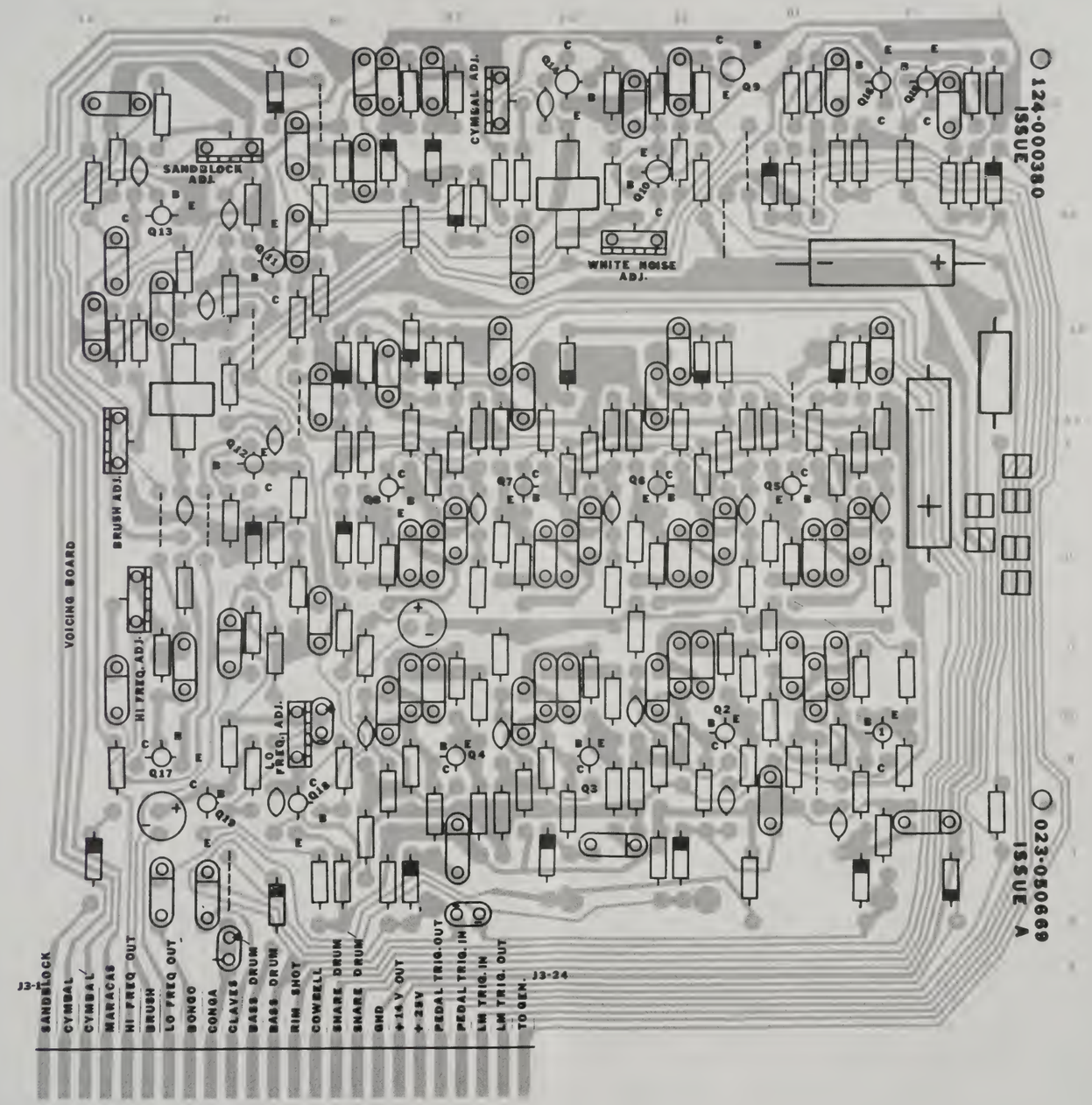
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
8	Q1,Q2,Q3,Q4,Q5,Q8,Q12,Q14	001-021134	2N3394
6	Q6,Q7,Q10,Q11,Q13,Q19	001-021135	2N3394
2	Q15,Q16	001-021172	2N4249
1	Q9	001-021211	2N3565
2	Q17,Q18	001-021260	2N5826
20	D1 THRU D20	001-026080	1N4148
1	D21	001-023026	1N4744

REVISIONS	
A	REVISED.
B	R10 WAS 1M & R103 WAS 390K
C	ADDED WAVE FORMS & T.P. NOS.
D	R10 WAS 680K & R124 WAS 470.
E	C20 WAS .082, R46 WAS 820K, R71 WAS 560K.

Voicing PWB

Schematic

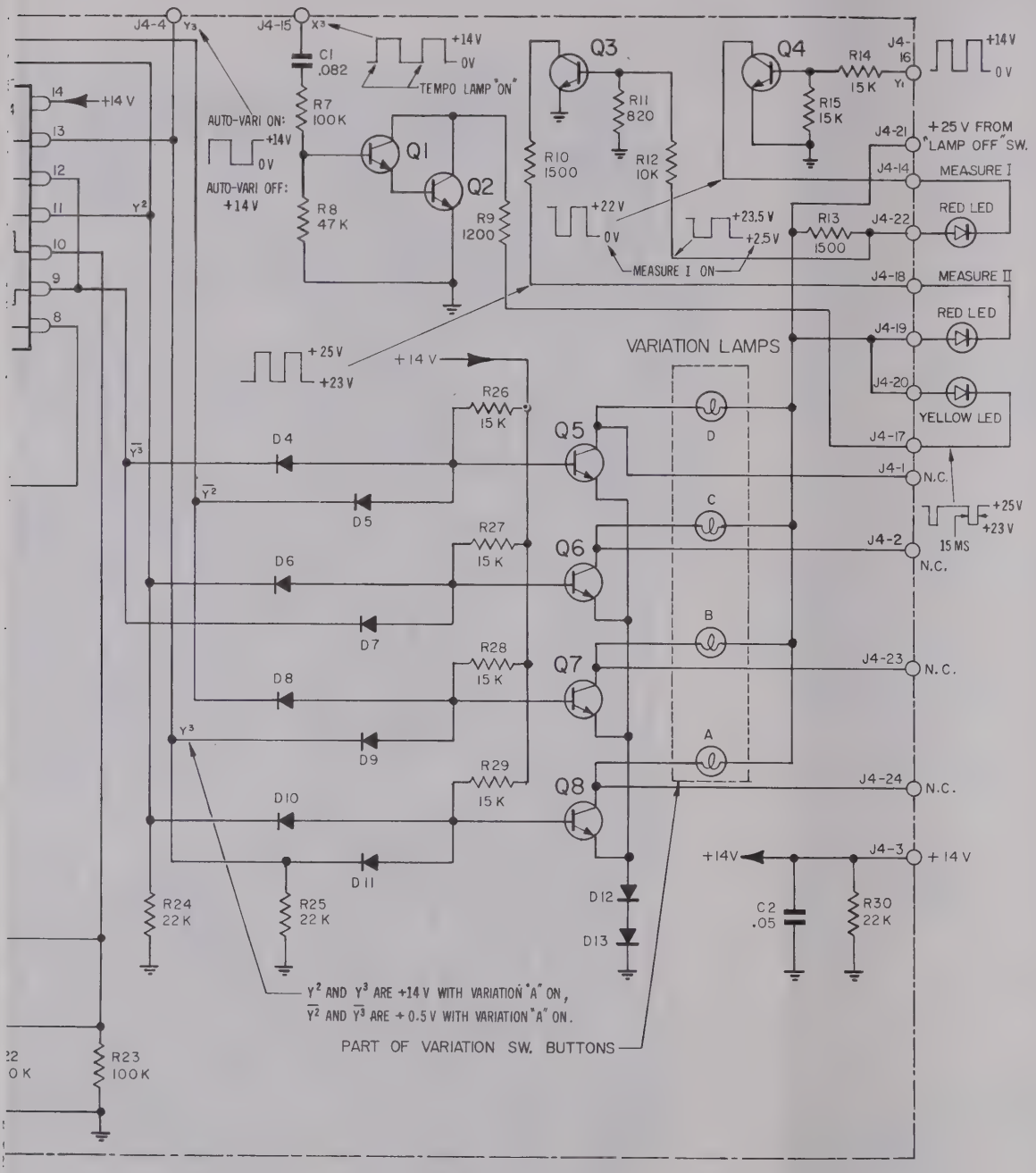
124-000380



Voicing PWB

Layout

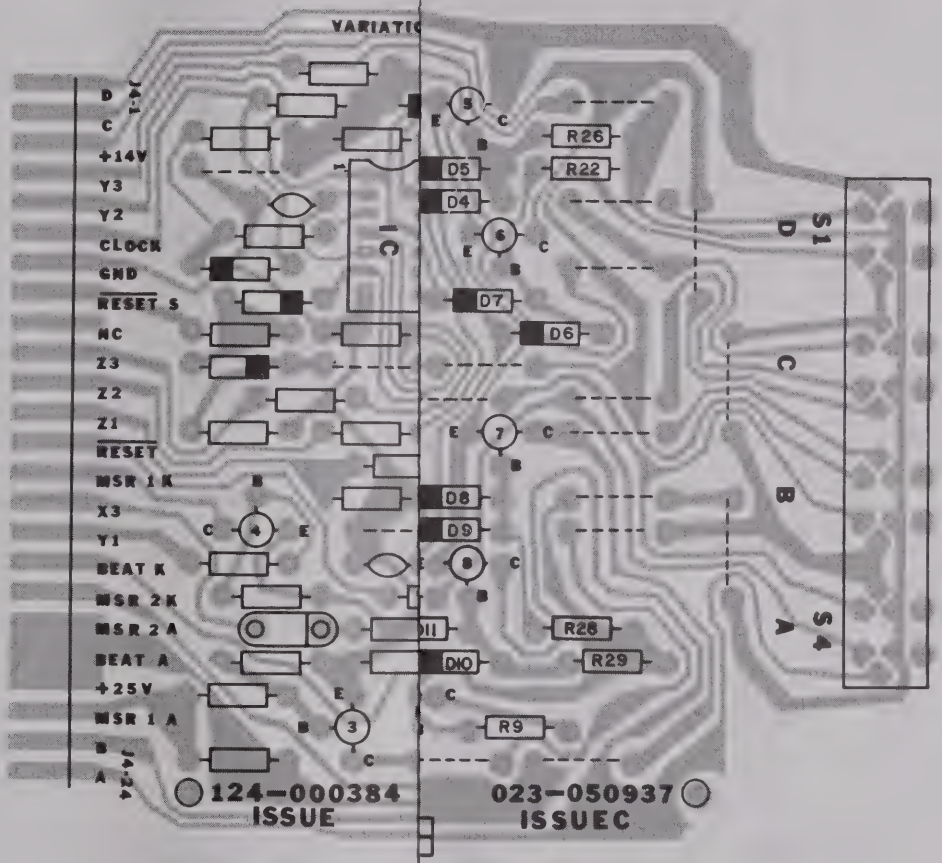
124-000380



PART #	JEDEC PART #
35	2N 3394
5080	IN 4148
0100	———

REVISIONS			
A	C1 WAS .047. R18 WAS 47K.	H	R17 WAS 10K. ADDED NOTE 4. NOTES: RESISTORS WERE 10%.
B	R1 & R2 WERE 10K. R17 WAS 100K. R18 (22K) DELETED.	J	R11 WAS 2200. R12 WAS 27K. R14 WAS 33K. PIN 22 WAVEFORM WAS 2.2V.
C	R15 WAS 100K. YELLOW LED WAS GRN.	K	IC1,2 WERE 023-000100
D	R9 WAS 560. WAVE FORMS & FUNCTION VOLTAGE NOTATIONS ADDED.	L	C4 WAS 680 pF
E	ADDED C3 & C4. R6 DELETED.		
F	BD. ASY NO. WAS 124-000384.		
G	R16 220K REMOVED, D1 REMOVED CHANGED "AUTOVARY ON" WAVEFORM.		

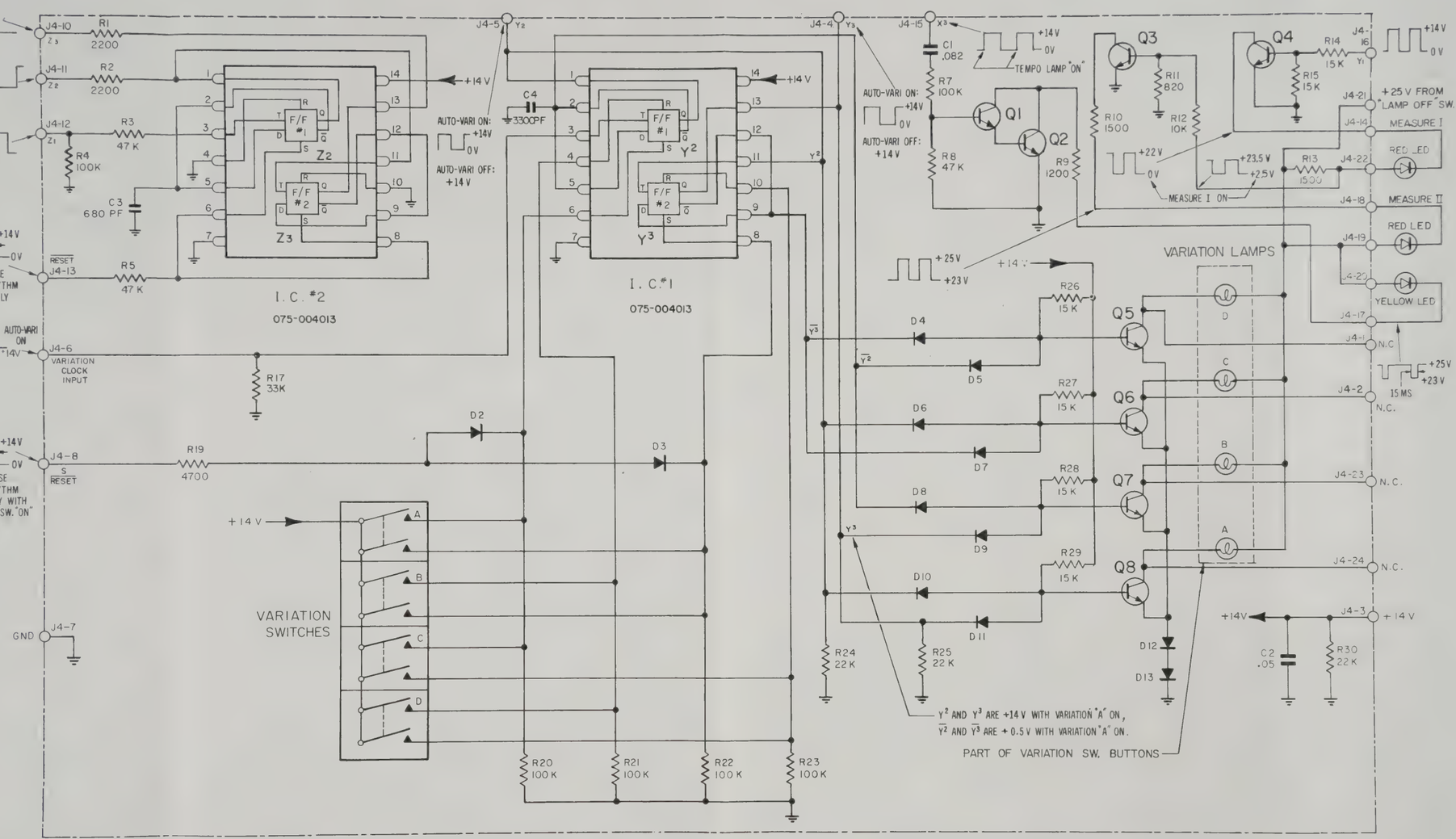
34



Variation PWB

Layout

124-000384, 418



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 5 %;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
   ALL TRANSISTORS 001-021135
   ALL DIODES 001-026080
2. SYMBOL —○— INDICATES EDGE CONNECTOR PIN NUMBER.
3. LAMPS SHOWN ARE G.E. NO#85.
4. FOR FIELD REPLACEMENTS 10% RESISTORS MAY BE SUBSTITUTED FOR 5%.

QTY	DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
8	Q1 THRU Q8	001-021135	2N 3394
13	D1 THRU D13	001-026080	IN 4148
2	I.C. #1 & I.C. #2	075-000100	———

124-000418,384

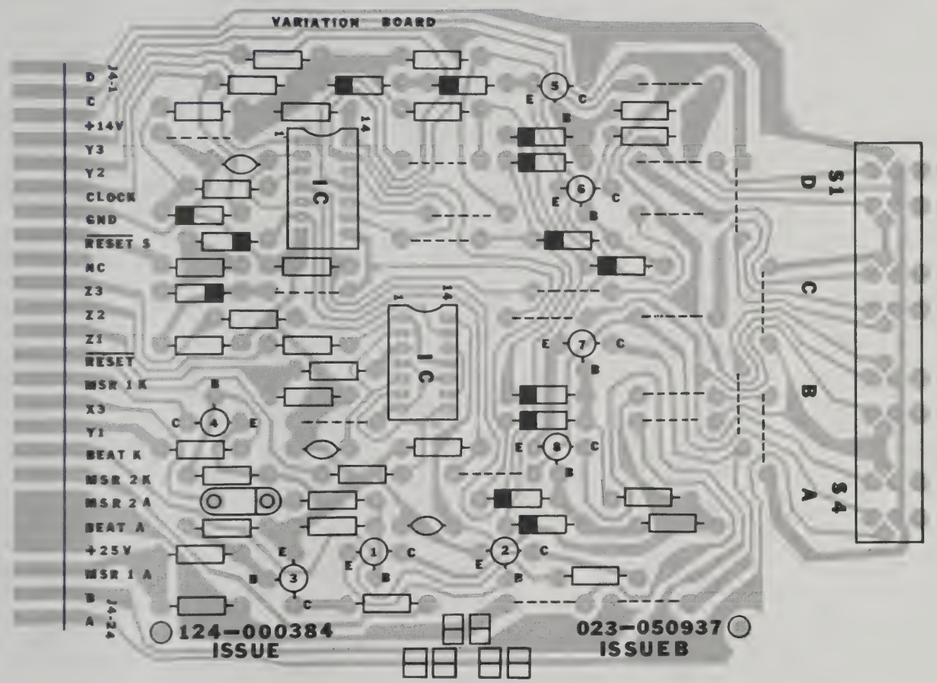
094-050938-L

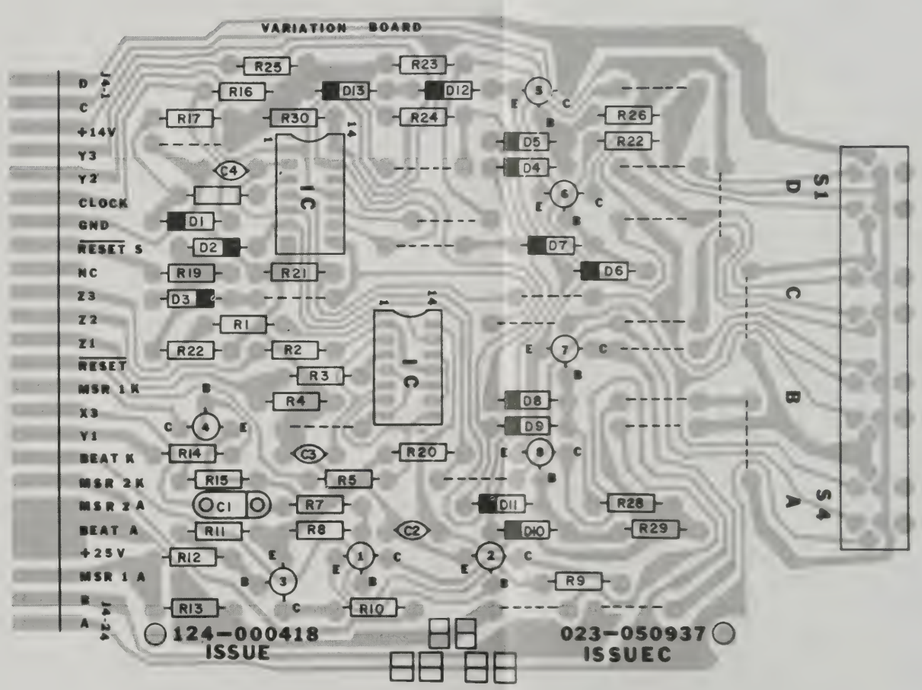
REVISIONS			
A	C1 WAS .047. R18 WAS 47 K.	H	R17 WAS 10K. ADDED NOTE 4. NOTES: RESISTORS WERE 10%.
B	R1 & R2 WERE 10K. R17 WAS 100K. R18 (22K) DELETED.	J	R11 WAS 2200. R12 WAS 27K. R14 WAS 33K. PIN 22 WAVEFORM WAS 2.2V.
C	R15 WAS 100K. YELLOW LED WAS GRN.	K	IC 1,2 WERE 023-000100
D	R9 WAS 560. WAVE FORMS & FUNCTION VOLTAGE NOTATIONS ADDED.	L	C4 WAS 680 pF
E	ADDED C3 & C4. R6 DELETED.		
F	BD. ASY. NO. WAS 124-000384.		
G	R16 220K REMOVED. D1 REMOVED. CHANGED "AUTO VARY ON" WAVEFORM.		

Variation PWB

Schematic

124-000384, 418

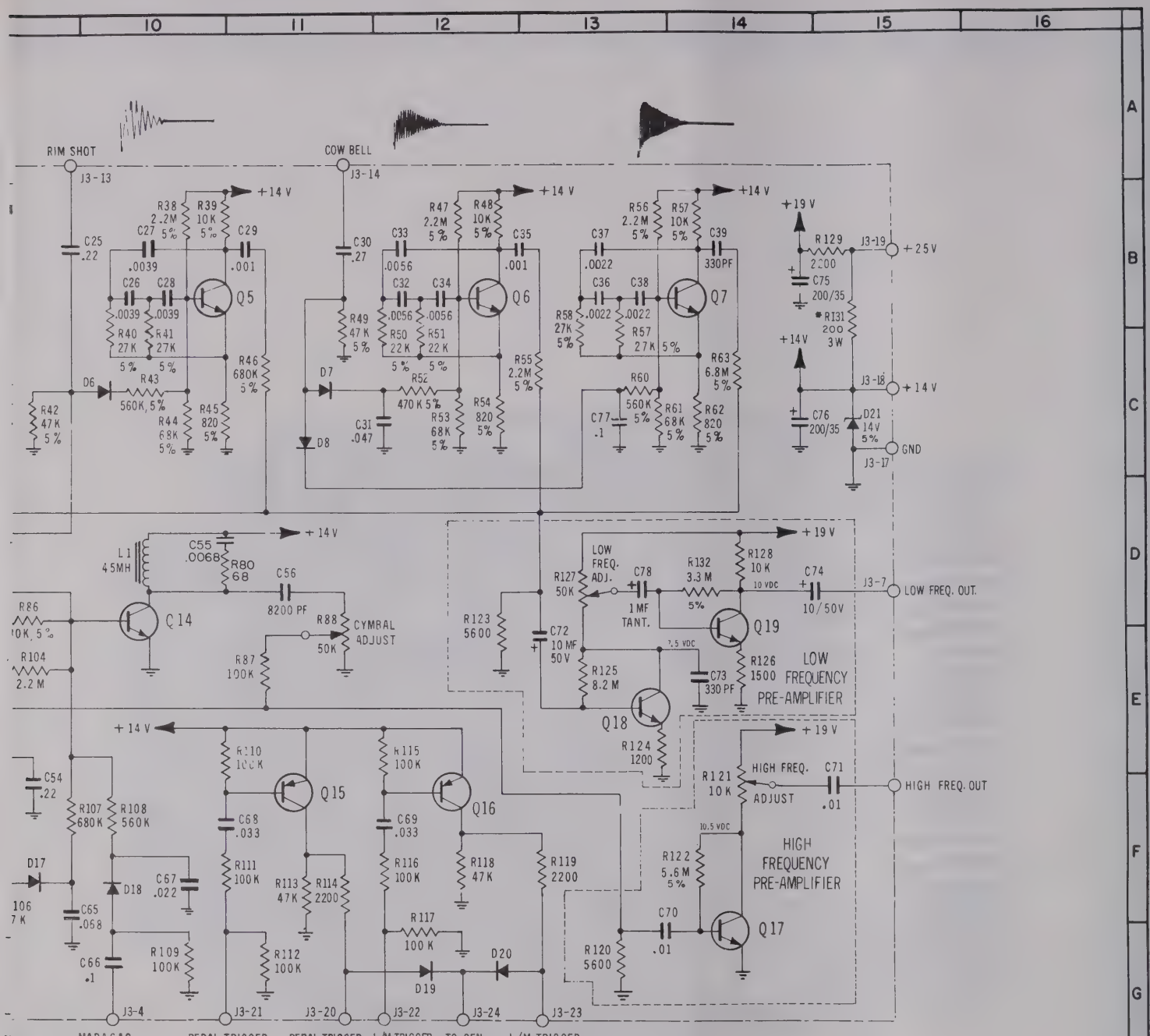




Variation PWB

Layout

124-000384, 418

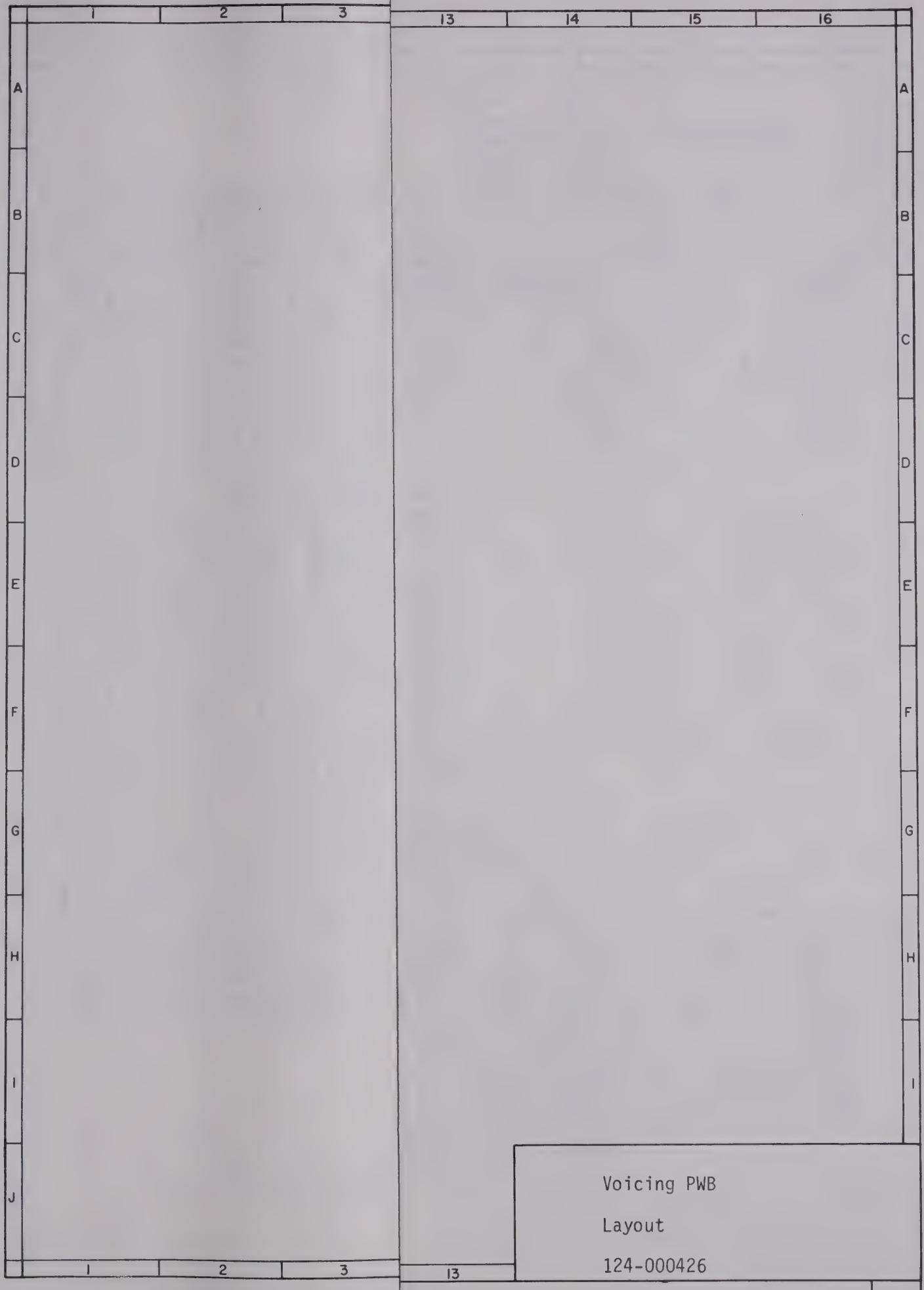


QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
8	Q1,Q2,Q3,Q4,Q5,Q8,Q12,Q14	001-021134	2N 3394
6	Q6,Q7, Q11,Q13,Q19	001-021135	2N 3394
2	Q15,Q16	001-021172	2N 4249
2	Q17,Q18	001-021260	2N 5826
20	D1 THRU D20	001-026080	1N 4148
1	D21	001-023026	1N4744

NOTES (CONT.)

5. * DENOTES COMPONENT WHICH MUST BE SPACED ≥ 10 MM ABOVE PWB PER N.D.S. REQUIREMENTS.

REVISIONS		
A	REMOVED "59" WHEREVER SPECIFIED IN BODY OF DWG. NOTE 1, RESISTOR TOL. WAS 10%. ADDED NOTE 4.	
B	R132, RI22 WERE 2%.	
C	ADDED ASTERISKS TO RI31, NOTE 5.	


1
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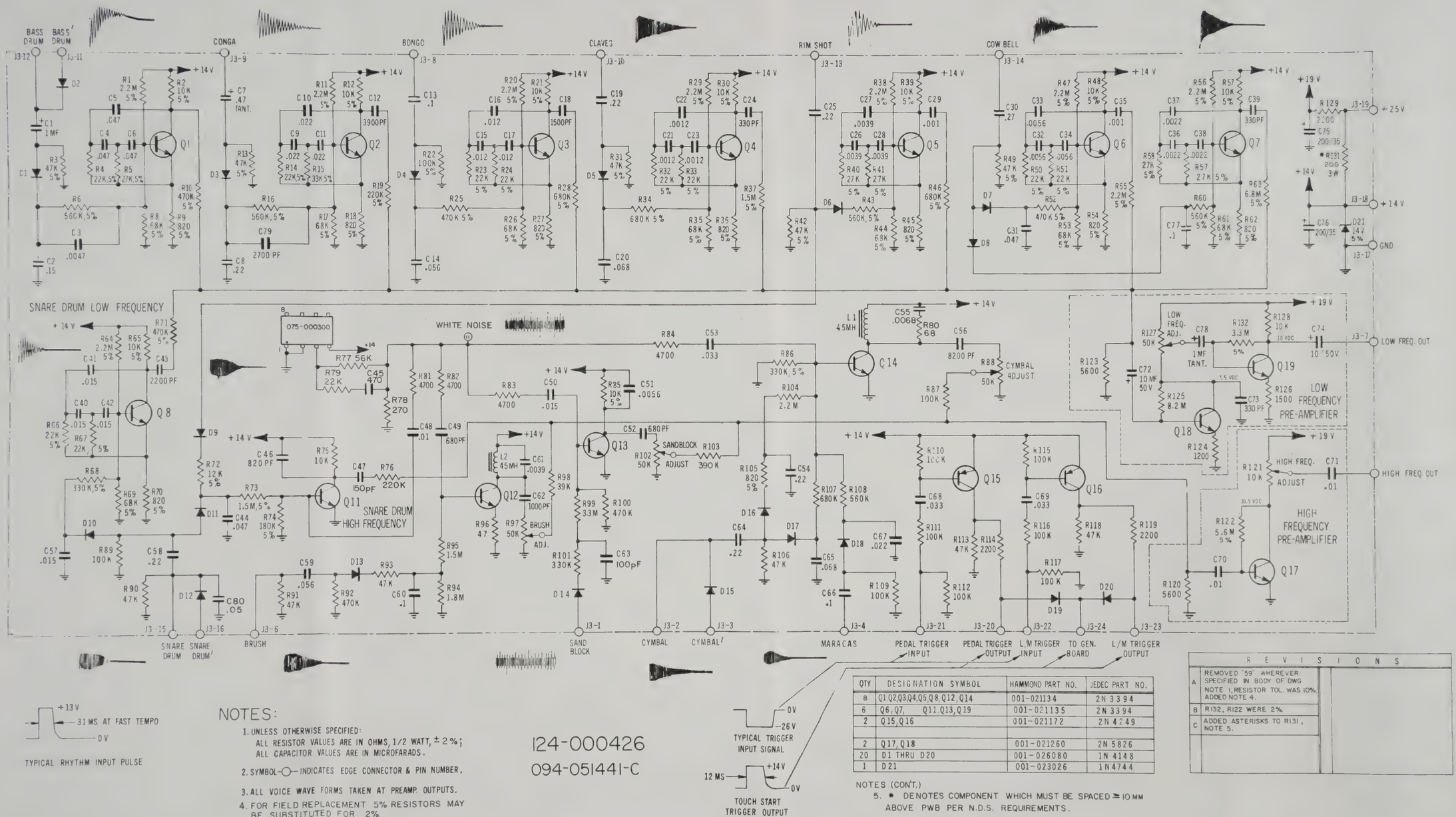
J
Voicing PWB
Layout
124-000426



+13 V
31 MS AT FAST TEMPO
0 V

TYPICAL RHYTHM INPUT PULSE

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 2%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL —○— INDICATES EDGE CONNECTOR & PIN NUMBER.
3. ALL VOICE WAVE FORMS TAKEN AT PREAMP. OUTPUTS.
4. FOR FIELD REPLACEMENT 5% RESISTORS MAY BE SUBSTITUTED FOR 2%.

124-000426
094-051441-C

0V
−26 V
TYPICAL TRIGGER INPUT SIGNAL

12 MS
+14V
0V
TOUCH START TRIGGER OUTPUT

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
8	Q1,Q2,Q3,Q4,Q5,Q8,Q12,Q14	001-021134	2N3394
6	Q6,Q7, Q11,Q13,Q19	001-021135	2N3394
2	Q15,Q16	001-021172	2N4249
2	Q17,Q18	001-021260	2N5826
20	D1 THRU D20	001-026080	1N4148
1	D21	001-023026	1N4744

NOTES (CON'T.)

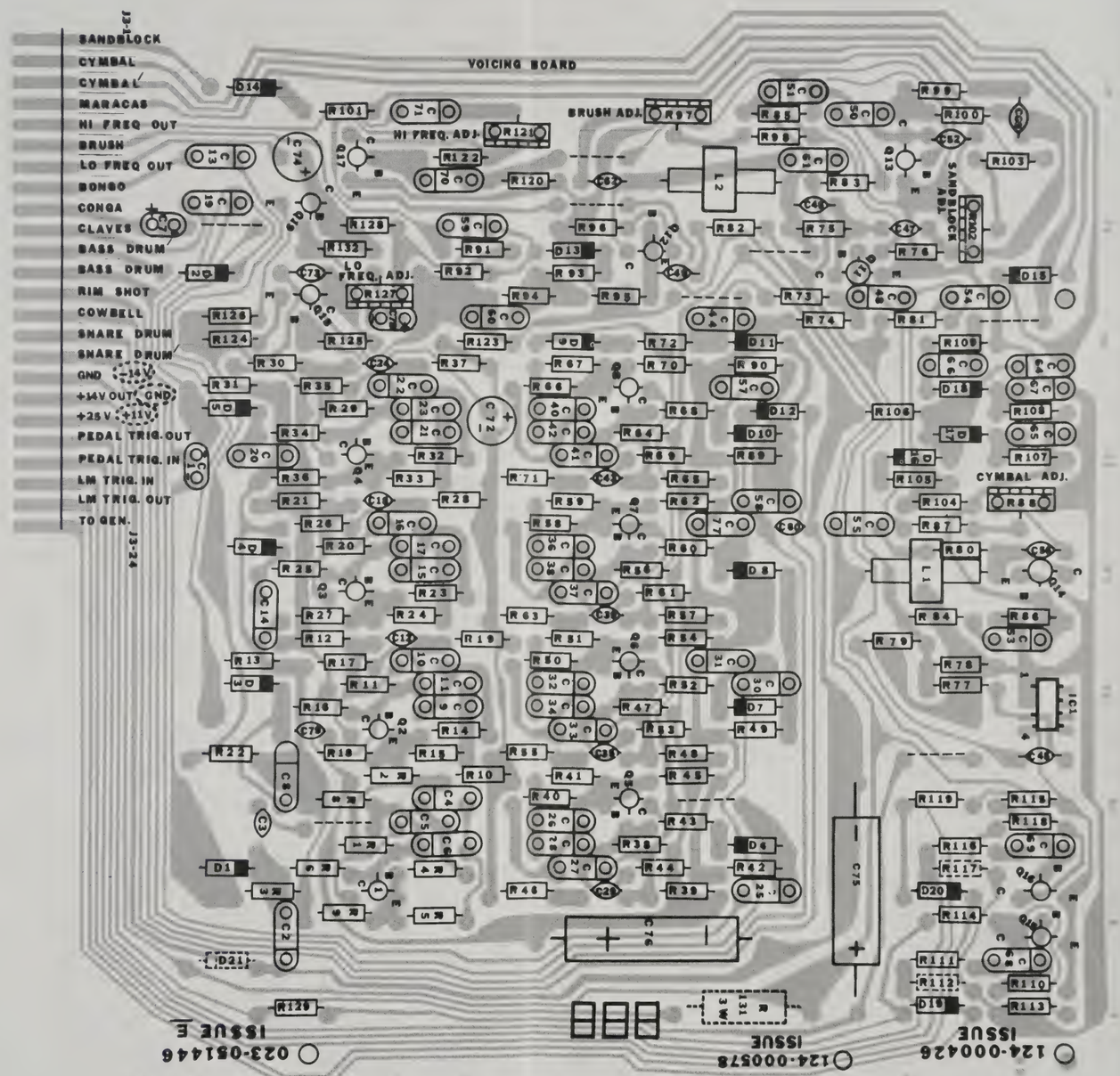
5. * DENOTES COMPONENT WHICH MUST BE SPACED ≥ 10 MM ABOVE PWB PER N.D.S. REQUIREMENTS.

REVISIONS		
A	REMOVED "59" WHEREVER SPECIFIED IN BODY OF DWG NOTE 1, RESISTOR TOL. WAS 10%. ADDED NOTE 4.	
B	R132, R122 WERE 2%.	
C	ADDED ASTERISKS TO R131, NOTE 5.	

Voicing PWB

Schematic

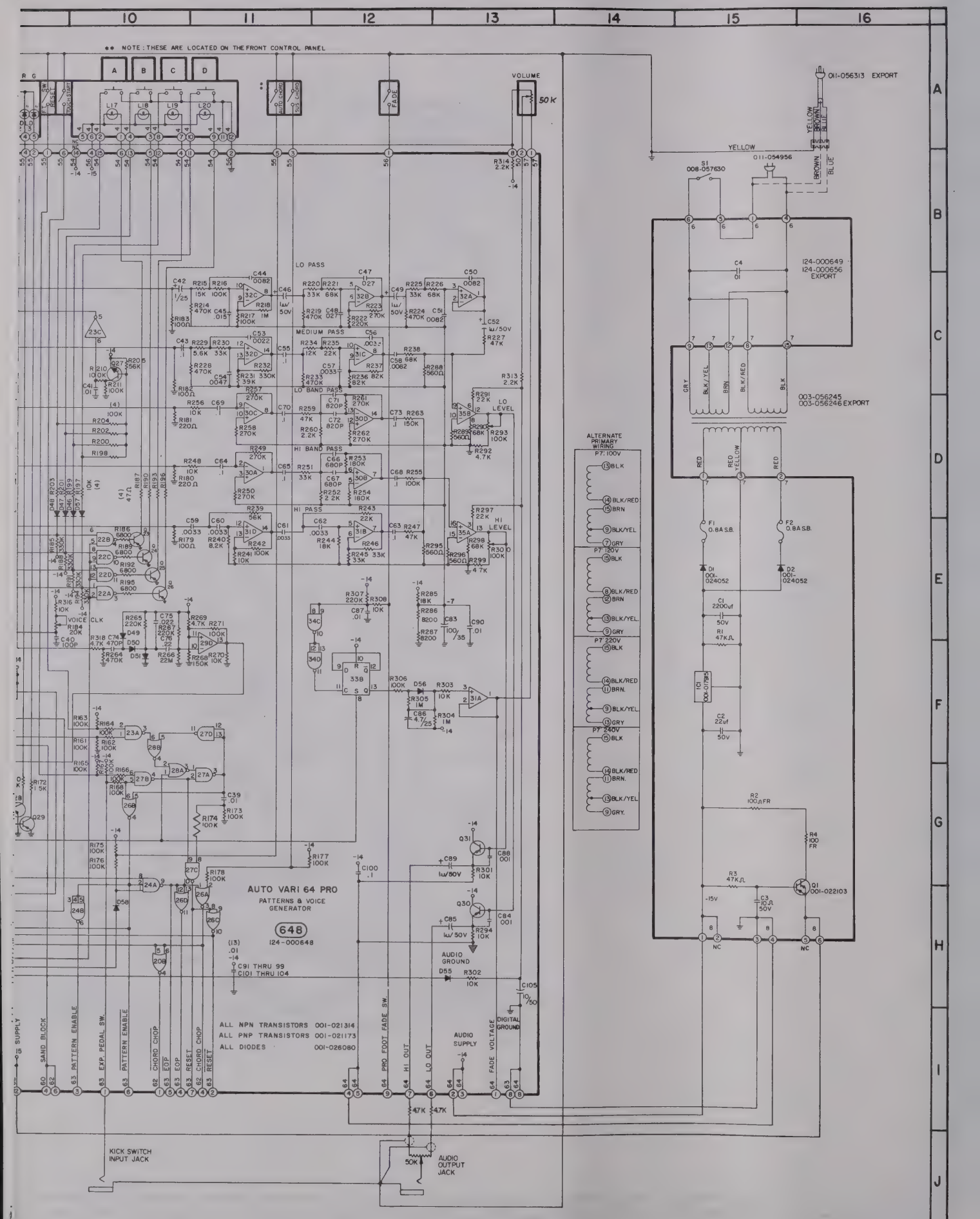
124-000426

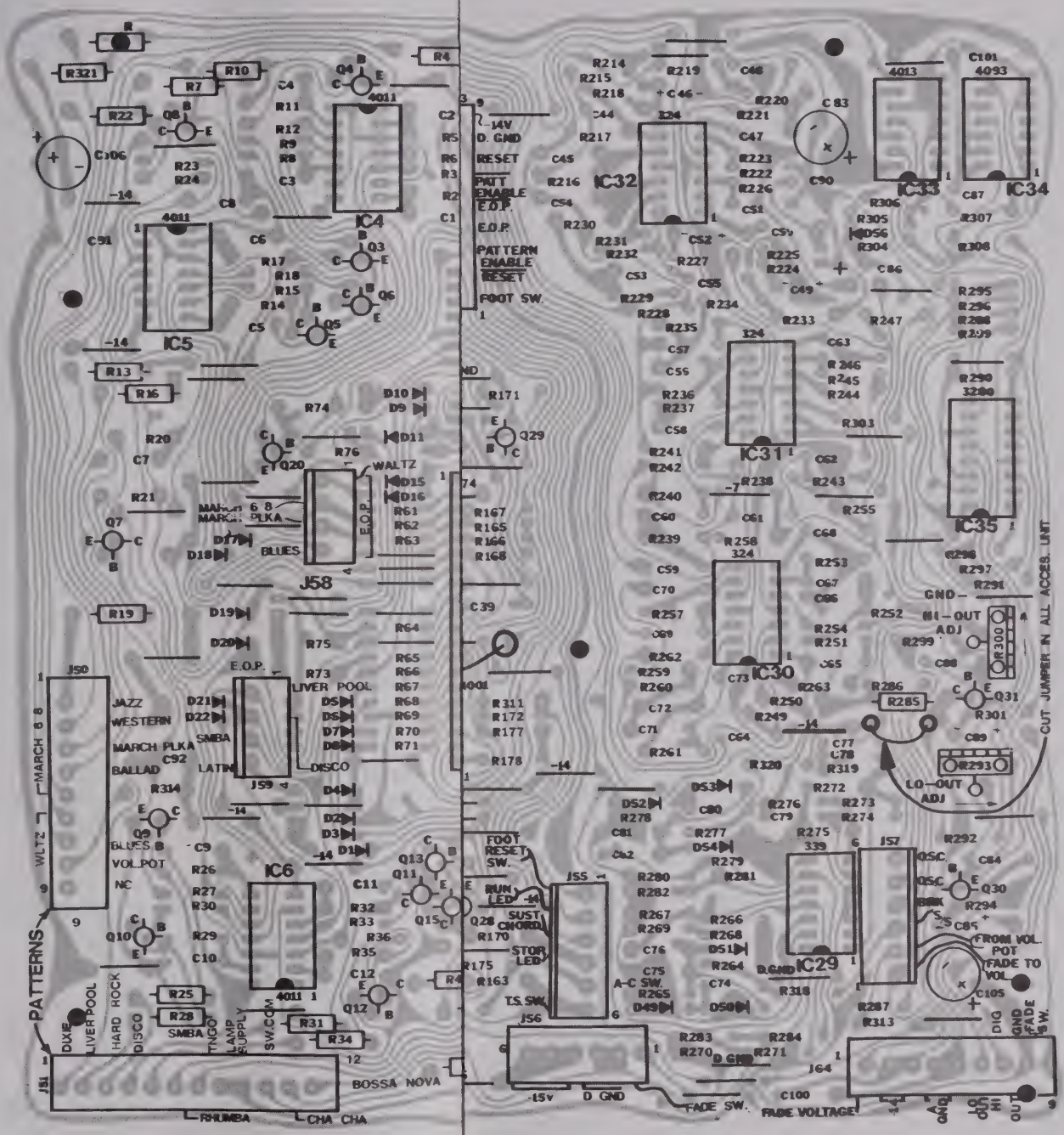


Voicing PWB

Layout

124-000426


** NOTE: THESE ARE LOCATED ON THE FRONT CONTROL PANEL
AUTO VARI 64 PRO
PATTERNS & VOICE GENERATOR
648
124-000648
ALL NPN TRANSISTORS 001-021314
ALL PNP TRANSISTORS 001-021173
ALL DIODES 001-026080
LO PASS
MEDIUM PASS
LO BAND PASS
HI BAND PASS
HI PASS
LO LEVEL
HI LEVEL
VOLUME
50K
FADE
AUTO CHORD
BASS CHORD
ALTERNATE PRIMARY WIRING
P7 100V
P7 120V
P7 220V
P7 240V
011-056313 EXPORT
011-054956
008-057630
124-000649
124-000656 EXPORT
003-056245
003-056246 EXPORT
F1 0.8A S.B.
F2 0.8A S.B.
D1 001-024052
D2 001-024052
C1 2200uf 50V
R1 47K Ω
C2 22uf 50V
R2 100Ω FR
R4 100 FR
R3 47KΩ
Q1 001-022103
C3 10Ω 50V
-15V
NC
NC
AUDIO GROUND
DIGITAL GROUND
AUDIO SUPPLY
FADE VOLTAGE
HI OUT
LO OUT
PRO FOOT FADE SW.
SAND BLOCK
PATTERN ENABLE
EXP. PEDAL SW.
CHORD CHOP
EOP
RESET
47K
KICK SWITCH INPUT JACK
50K
AUDIO OUTPUT JACK

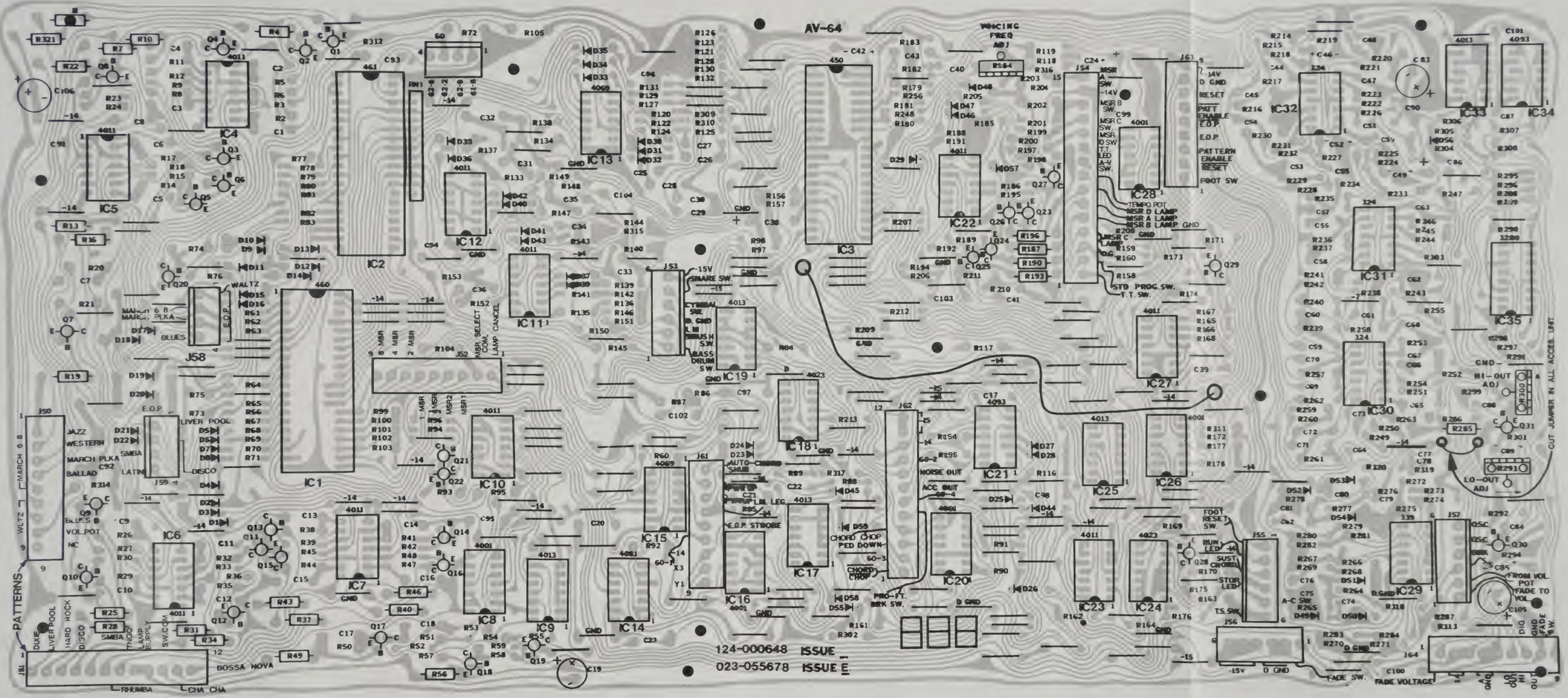


Auto Vari 64 PWB

Layout

124-000648

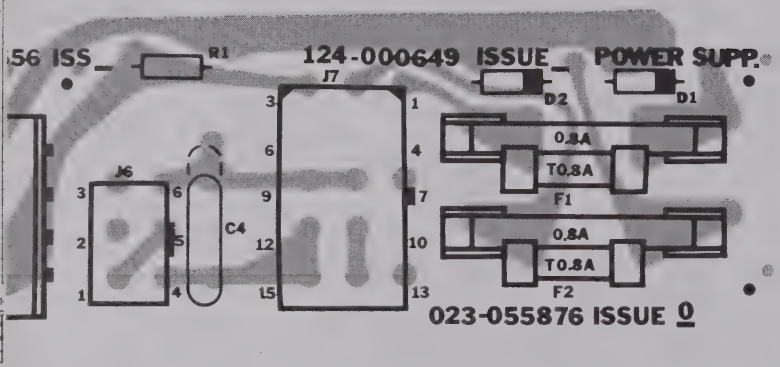
Auto Vari 64 PWB
Power Supply PWB
Schematics
124-000648 & 649, 656



Auto Vari 64 PWB

Layout

124-000648


56 ISS_
R1
124-000649 ISSUE_
POWER SUPP.
J7
D2
D1
0.8A
T0.8A
F1
0.8A
T0.8A
F2
J6
C4
023-055876 ISSUE 0

SECTION VI
PARTS LIST

PARTS ORDERING INFORMATION

When ordering replacement parts from the Hammond Organ Company, the following guidelines should be observed:

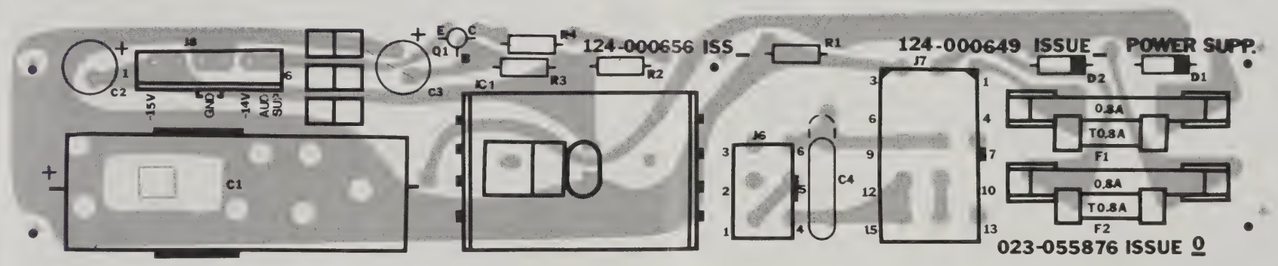
1) Address all parts orders to:

HAMMOND ORGAN COMPANY
PARTS DEPARTMENT
4200 W. DIVERSEY
CHICAGO, IL. 60639

2) All orders should specify the model and serial numbers of the instrument that is being serviced. (Note: On late model instruments the model and serial numbers are printed on the tag attached to the underside of the organ keyboard.)

3) All orders should specify the Hammond part numbers of the desired parts.

4) All orders should provide a specific description of the desired parts. (For example: Power transformer, 15 volt zener diode, F through B key module, etc.)



AV 64 Accessory Power Supply PWB

Layout

124-000649, 656 (export)

SECTION VI
PARTS LIST

PARTS ORDERING INFORMATION

When ordering replacement parts from the Hammond Organ Company, the following guidelines should be observed:

1) Address all parts orders to:

HAMMOND ORGAN COMPANY
PARTS DEPARTMENT
4200 W. DIVERSEY
CHICAGO, IL. 60639

2) All orders should specify the model and serial numbers of the instrument that is being serviced. (Note: On late model instruments the model and serial numbers are printed on the tag attached to the underside of the organ keyboard.)

3) All orders should specify the Hammond part numbers of the desired parts.

4) All orders should provide a specific description of the desired parts. (For example: Power transformer, 15 volt zener diode, F through B key module, etc.)

PARTS LIST EXPLANATION

This parts list begins by listing all the major assemblies (designated by a ◯) and their part numbers on pages 6-5 thru 6-7. Major assembly breakdowns are then listed numerically (①, ②, ③, etc. . .) on the on the following pages. The format for which major assemblies are broken down is shown below.

⑥ Major Assembly

1 Minor Assembly
2 " "
3 " "
.
.
.

a Component of Minor Assembly
b " " " "
c " " " "

i Sub-Component
ii "
iii "

Example:

⑥	Lower Keyboard Assembly	119-000095
1	Preset Key Module	057-054157
2	Preset Key Module	057-054156
3	Key Module	057-054077-005
.		
.		
.		
37	Visual Memory Cancel Assembly	060-053454-001
a	Spring	012-028799
b	Grommet	043-053308
.		
.		
.		
m	Screw	999-054489
i	Washer	999-000810

PWB Assemblies are symbolized by ⬭ and are listed in numerical order following the Major Assembly breakdowns.

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Auto Vari 64 Model 101100

MAJOR ASSEMBLY — PAGE

1. AUTO VARI COVER ASSEMBLY.....6-3

2. AUTO VARI 64 ASSEMBLY.....6-4

P.W.B. ASSEMBLIES

(P.W.B. Assemblies are listed in Sequential order begining on Page 6-5)

(101300 Table of Contents begins on Page 6-7)

(1.) COVER ASSEMBLY (FIG. 1a).....051-002640
(NOTE: COVER ASSEMBLY DOES NOT INCLUDE MUSIC PANEL OR BOTTOM PANEL)

1. MUSIC PANEL.....045-050928
2. BOTTOM PANEL 051-002647
3. BUMPER (4 USED) 043-053920
   a. SCREW (4 USED).....885-051334
   b. WASHER (4 USED) 999-000050
4. END CAP (LEFT HAND) 051-002645
   (RIGHT HAND).....051-002645-001
5. BEZEL (2 USED) 025-050726
6. LOGO (EMBOSSED) (2 USED) 037-043351-001
7. INSERTS (4 USED).....999-016971

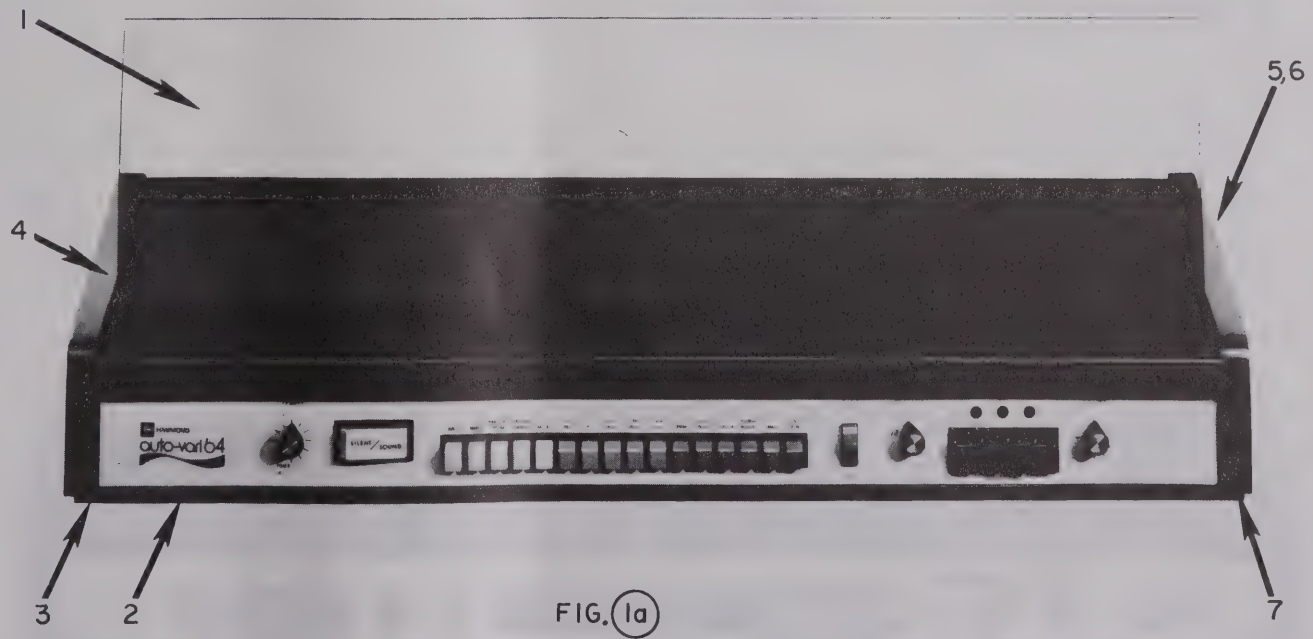

FIG. (1a)

(2.) AUTO-VARI 64 ASSEMBLY (FIG. 2a & 2b)

DOMESTIC 120V/60HZ.....125-000115
EXPORT 220V/50-60HZ 125-000115-001
(NOTE: AUTO-VARI ASSEMBLY DOES NOT INCLUDE CONTROL PANEL, 3 GOLD KNOBS, TOGGLE CAP AND LED ASSEMBLIES)

1. CONTROL PANEL.....061-050645
   a. SCREWS 927-050534
2. KNOB VOLUME, MEASURE, TEMPO 031-046282-002
3. TOGGLE CAP (VARIATION ON/OFF).....025-050616-001
4. SILENT/SOUND ROCKER SWITCH 008-053186
   a. INLAY 038-053199
   b. SCREWS.....827-040334
5. KNOBS (PATTERN SELECT) IVORY (5 USED) 025-045282
   BLUE (5 USED) 025-050933-001
   MAGENTA (6 USED)..025-050933
6. VARIATION LENS "A" 025-050951
   "B" 025-050951-001
   "C".....025-050951-002
   "D" 025-050951-003
7. L.E.D. ASSEMBLY (RED) (2 USED) 016-050957
   (GREEN).....016-050956
   a. RED L.E.D. 001-026120
   b. GREEN L.E.D. 001-026121
   c. MOUNTING COLLAR.....013-046366
   d. MOUNTING CLIP 013-046365
8. POTENTIOMETER (VOLUME) (20K) 676-000270
   a. HEX NUT (GUIDE BUSHING).....017-049531-001
   b. LOCK WASHER 999-000846
9. VARIATION SWITCH ASSEMBLY 008-050673
   a. INDICATOR LAMP GE #85 28V/.04A....016-050949
   b. ESCUTCHEON 025-050665
   c. SCREWS 884-030334
10. MEASURE SWITCH.....008-050637
   a. HEX NUT (GUIDE BUSHING) 017-049531-001
   b. LOCK WASHER 999-000846
11. VARIATION ON/OFF SWITCH.....008-050615
   a. SPACER 044-050676
   b. SCREWS 885-050734
12. ESCUTCHEON (PATTERN SWITCH).....025-050601
   a. SCREWS 884-031534
13. ESCUCHEON (SILENT/SOUND) 025-050629
   a. SCREWS.....884-030734
14. POTENTIOMETER (TEMPO) (500K) 676-000284
   a. GUIDE BUSHING 017-049531-001
   b. LOCK WASHER.....999-000846
15. MOUNTING BRACKET (LEFT HAND) 062-050967
   (RIGHT HAND) 062-050967-001
   a. SCREWS.....909-030934
   b. WASHER 999-000016
16. VOICING P.W.B. 124-000426
   (EARLY MODELS).....124-000380
17. PATTERN GENERATOR P.W.B. 124-000379
18. VARIATION P.W.B. 124-000418
   (EARLY MODELS).....124-000384
19. CONNECTOR P2 (15 CKT) 005-043371
   a. CONTACT PIN 007-043171
20. CONNECTOR P3 & P4 (24 CKT).....005-043361
   a. CONTACT PIN 007-043171
21. CONNECTOR P1 (22 CKT) 005-043363
22. BACK PANEL.....061-050659
   a. SPACER (3 USED) 027-050974
   b. SCREW (3 USED) 885-070733
23. LINE CORD.....011-045043
24. STRAIN RELIEF 013-034996
25. POWER TRANSFORMER (120/220/240V 50/60HZ)003-050971
   a. SCREW.....827-070334
   b. NUT 999-001113
   c. LOCK WASHER 999-000818
26. TERMINAL STRIP.....006-030895
   a. CAPACITOR 434-208509
      i MOUNTING CLIP 013-050950
      ii SCREW.....827-070214
      iii NUT 999-001113
   b. CAPACITOR (CERAMIC) .01UF 425-040803
   c. RECTIFIER 1A (2 USED).....001-024052
   d. FUSE .2 AMP (2 USED) 016-050544
   e. SCREW (TERMINAL STRIP) 827-070334
   f. NUT (TERMINAL STRIP).....999-001113
   g. LOCK WASHER (TERMINAL STRIP) 999-000818
27. PHONE JACK (2 USED) 005-028532
28. POTENTIOMETER (50K).....676-000166
29. SPRING CLIP LONG (4 USED) 012-050639
   SHORT (4 USED) 012-050930
30. RETAINER CLIP (USED W/SHORT SPRING CLIP)012-051429
31. CABLE CLAMP.....013-042240

AUTO VARI FOOT SWITCH (OPTIONAL).....130-910010

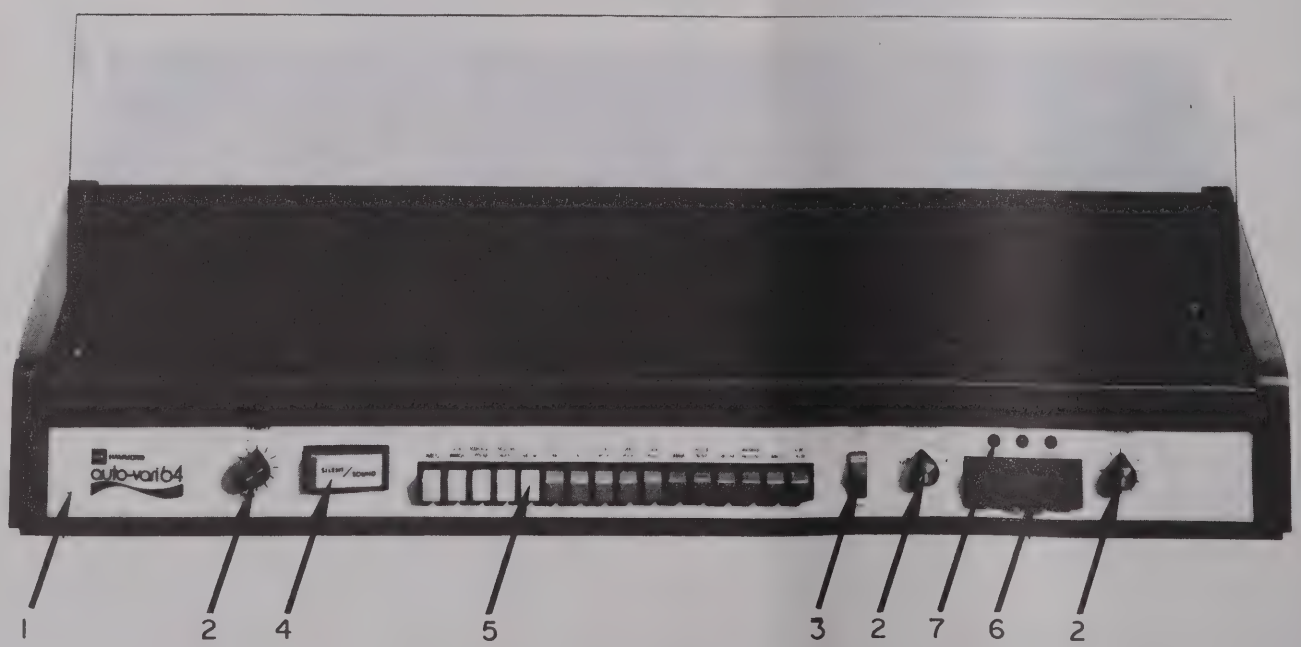

FIG. (2a)

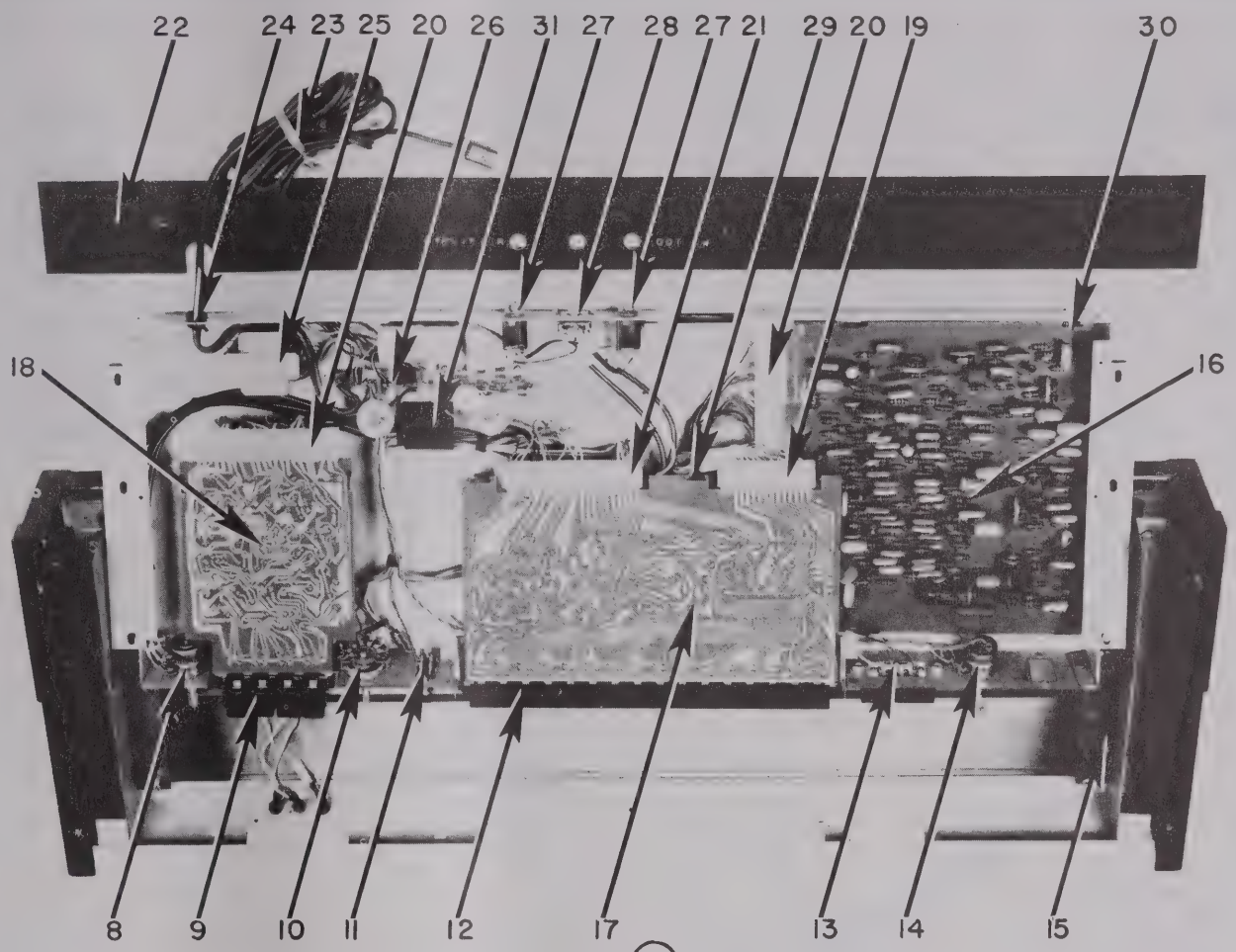

FIG. 2b

(379) PATTERN GENERATOR P.W.B 124-000379

TRANSISTOR	Q2-6,11,12,16,17	001-021133
	Q9,13,14	001-021135
	Q7,8,10,15	001-021172
	Q1	001-026050
DIODE, SIGNAL, (ALL)		001-226080
SWITCH ASSEMBLY		008-050612
KNOBS IVORY	(5 USED)	025-045482
MAGENTA	(5 USED)	025-050933
BLUE	(6 USED)	025-050933-001
INTEGRATED CIRCUIT IC1		075-000430

(380) VOICING P.W.B. 124-000380

TRANSISTOR	Q1-5,8,12,14	001-021134
	Q6,7,10,11,13,19	001-021135
	Q15, 16	001-021172
	Q9	001-021210
	Q17,18	001-021260
DIODE, ZENER	D21 14V,1W	001-223026
SIGNAL	D1-20	001-226080
CHOKE	L1,2 45MH	003-030753
SOCKET (TRANSISTOR)		004-048898
CAPACITOR, ELECTROLYTIC		
	C75,76 200MFD/35V	431-207359
	C72,74 10MFD/50V	432-106509
CAPACITOR, TANTALUM		
	C1,78 1MFD/35V	435-105354
	C7 .047MFD/35V	435-474352
RESISTOR	R131 180 OHM 3W	602-050201
TRIMMER POT	R79,121 10K	676-000064
	R88,97,102,127 50K	676-000069

(384) VARIATION P.W.B. 124-000384

TRANSISTOR	Q1-8	001-021135
DIODE (ALL)		001-226080
SWITCH ASSEMBLY		008-050673
INDICATOR LAMP (4 USED) GE#85 28V/.04A		016-050949
INTEGRATED CIRCUIT	IC1,2	075-000100

(426) VOICING P.W.B. 124-000426

TRANSISTOR	Q1-5,8,12,14	001-021134
	Q6,7,11,13,19	001-021135
	Q15,16	001-021172
	Q17,18	001-021260
DIODE, ZENER	D21 14V IW	001-223026
SIGNAL	D1-20	001-226080
CHOKE	L1,2 45MH	003-030753
INTEGRATED CIRCUIT	IC1	075-000300
CAPACITOR, ELECTROLYTIC		
	C75,76 200MFD/35V	431-207359
	C72,74 10MFD/50V	432-106509
CAPACITOR, TANTALUM		
	C1,78 1MFD/35V	435-105354
	C7 .47MFD/35V	435-474352
RESISTOR	R131 200 OHM 3W	602-050521
TRIMMER POT	R121 10K	676-000064
	R88,97,102,127 50K	676-000069

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P.W.B. ASSEMBLIES

(P.W.B. Assemblies are listed in Sequential order begining on Page 6-10)

(1.)	AUTO VARI COVER ASSY. COMPLETE(FIG. 1a & 1b)	051-004329
	COVER WITHOUT MUSIC PANEL	061-056347
1.	TOP PANEL	051-004331
2.	MUSIC PANEL ASSEMBLY	051-004342
	a. HINGE	032-033414
	b. SCREWS (HINGE)	882-030537
3.	TOP END LEFT HAND OR RIGHT HAND	085-004306-378
4.	END CAP (LEFT HAND)	051-004338
	(RIGHT HAND)	051-004339
5.	REAR RAIL	051-004341
6.	BOTTON PANEL ASSEMBLY	051-004344-001
	a. BUMPER (4 USED)	043-050932
7.	SCREW (BOTTOM PANEL) (4 USED)	879-071338
8.	TRIM BUSHING (3 USED)	013-057631

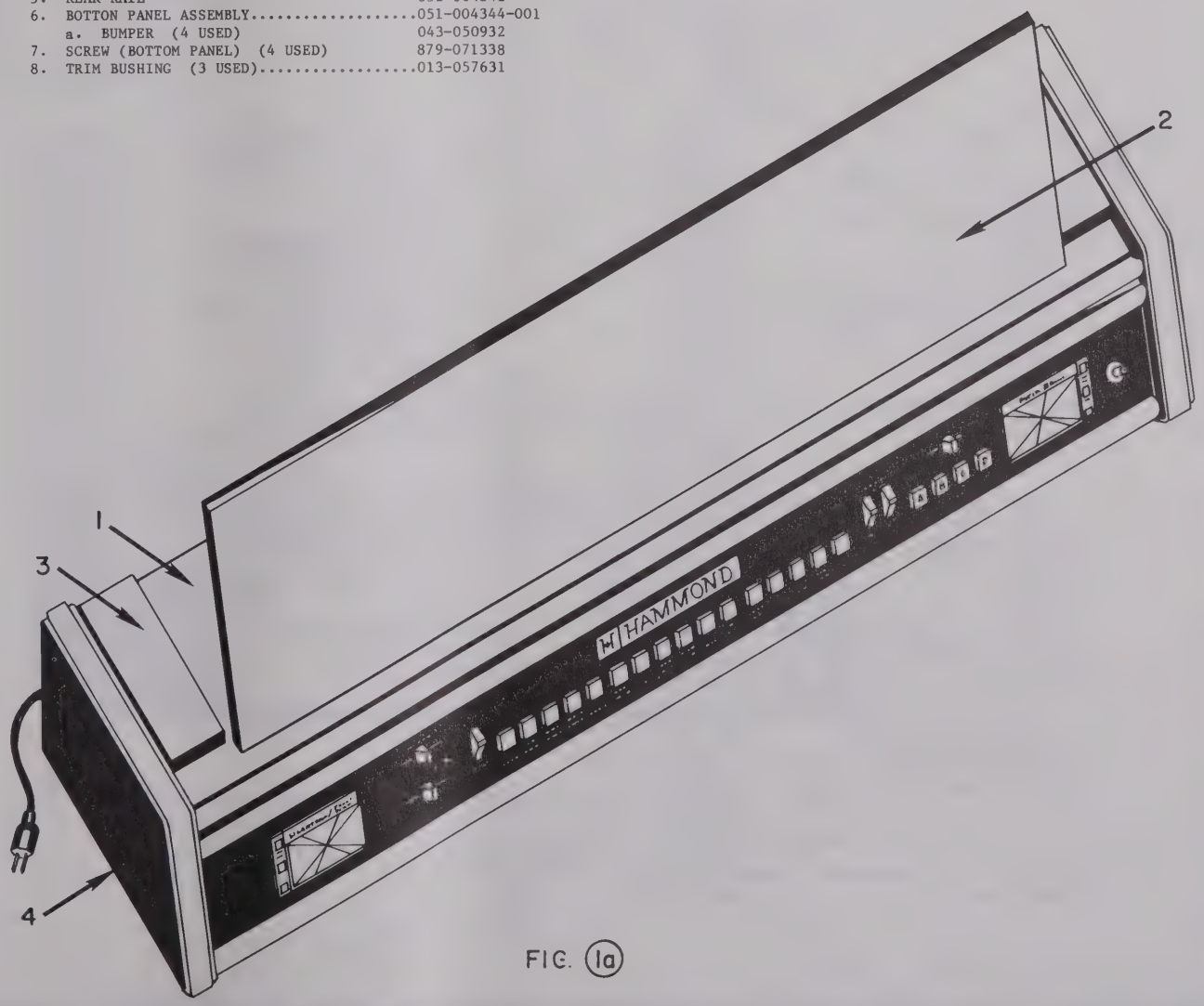

FIG. (1a)

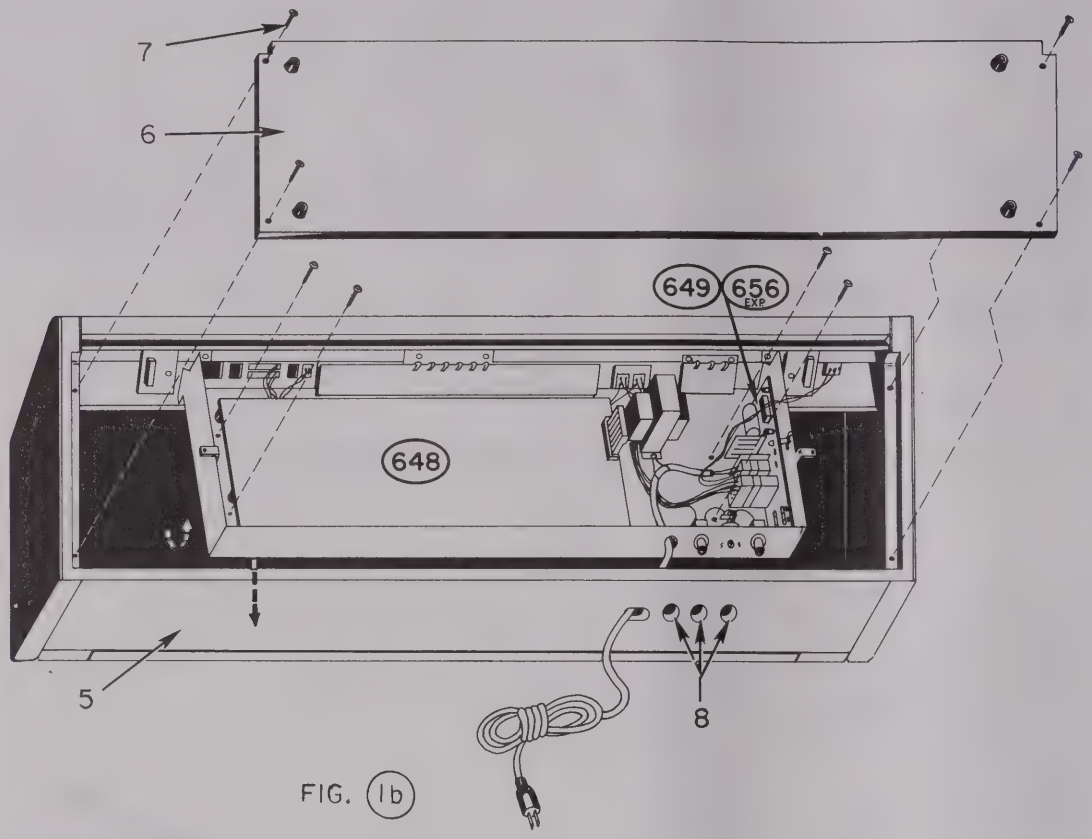

FIG. (1b)

(2.) AUTO VARI 64 ASSEMBLY (FIG. 2a & 2b)
DOMESTIC.....125-000219
EXPORT 125-000222

1. RHYTHM CONTROL PANEL (SCREENED) 061-056105
2. POWER SWITCH.....008-057630
3. RHYTHM BREAK TOUCH PAD ASSEMBLY 063-056044
   a. BEZEL 055-056028
   b. FOAM PAD.....043-056012
   c. TEMPO PLATE 055-056013
4. TEMPO/MEASURE SWITCH P.W.B. ASSEMBLY 008-055885
   a. AMBER SWITCH (MOMENTARY).....008-055903
   b. INDICATOR (RED) (2 USED) 016-055922
   c. LIGHT EMITTING DIODE (RED) (2 USED) 001-026131
   d. MOUNTING SPACER.....020-056014
   e. SCREWS 909-030538
5. VARIATION SWITCH P.W.B. ASSEMBLY 008-055884
   a. AMBER BUTTON INSERT (4 USED).....016-055998-006
   b. BUTTON STAMPED "A" 031-054768-021
      "B" 031-054768-022
      "C".....031-054768-023
      "D" 031-054768-024
   c. LIGHTED SWITCH (4 USED) 008-055938
   d. LAMPS (4 USED) GE #18 14V/.040A.....016-055886
6. SPRING CLIP (4 USED) 012-056015
   a. MOUNTING SCREWS 940-030338
7. MEASURE SLIDE SWITCH.....008-055933
   a. KNOB 025-053676-001
8. SWITCH (PROGRAM AND AUTO VARI) 008-050614
   a. SWITCH CAPS (LONG YELLOW).....025-050616
9. HAMMOND LOGO (EMBOSSED) 037-052752
10. PATTERN SWITCH P.W.B. ASSEMBLY 008-055883
   a. IVORY BUTTONS (5 USED).....016-054767-013
   b. RED BUTTONS (5 USED) 016-054767-002
   c. YELLOW BUTTONS (6 USED) 016-054767-011
   d. LIGHTED SWITCH (16 USED).....008-055938
   e. LAMP (16 USED) GE #18 14V/.040A 016-055886
11. POWER TRANSFORMER ASSEMBLY (DOMESTIC)...003-056245
   POWER TRANSFORMER ASSEMBLY (EXPORT) 003-056246
      SCREWS (2 USED) 827-070518
      NUT (2 USED).....999-001262
12. RHYTHM VOLUME SLIDE POTENTIOMETER (50K) 676-053147
   a. KNOB (GOLD) 025-053145-001
13. RHYTHM TEMPO SLIDE POTENTIOMETER (1 MEG)676-053142
   a. KNOB (GOLD) 025-053145-001
14. FADE SWITCH (SPRING RETURN) 008-055932
   a. SWITCH CAP (LONG YELLOW).....025-050616
15. SILENT SOUND TOUCH PAD ASSEMBLY 063-056043
   a. BEZEL 055-056027
   b. FOAM PAD.....043-056012
   c. TEMPO PLATE 055-056013
   d. SILENT SOUND P.W.B. ASSEMBLY 008-055882
   e. LIGHTED SWITCh (AMBER).....008-055913
   f. LIGHT EMITTING DIODE (YELLOW) 001-026133
   g. INDICATOR (RED) 016-055922
   h. LIGHT EMITTING DIODE (RED).....001-026131
   i. INDICATOR (GREEN) 016-055924
   j. LIGHT EMITTING DIODE (GREEN) 001-026132
16. TAP SCREW (10 USED).....940-060538
17. RHYTHM P.W.B. 124-000648
18. MOUNTING BUMPER (10 USED) 043-054353
   a. SCREW.....926-050938
19. MOUNTING SPACERS (3/8" DIAMETER 4 USED) 020-056014
   (1/4" DIAMETER 2 USED) 020-056016
20. SUPPORT BRACKET ASSEMBLY (LEFT HAND)....035-056103
   (RIGHT HAND) 035-056104
21. POWER SUPPLY P.W.B. (DOMESTIC) 124-000649
   (EXPORT).....124-000656
22. PHONE JACK (2 USED) 005-028532
23. POTENTIOMETER 50K 676-000166
24. LINE CORD ASSEMBLY (DOMESTIC).....011-054956
   (EXPORT) 011-054803
   a. STRAIN RELIEF 013-035004
25. P.W.B. MOUNTING SPACER (5 USED).....044-050582
26. TERMINAL STRIP 006-034306
27. SCREW (4 USED) 888-070938

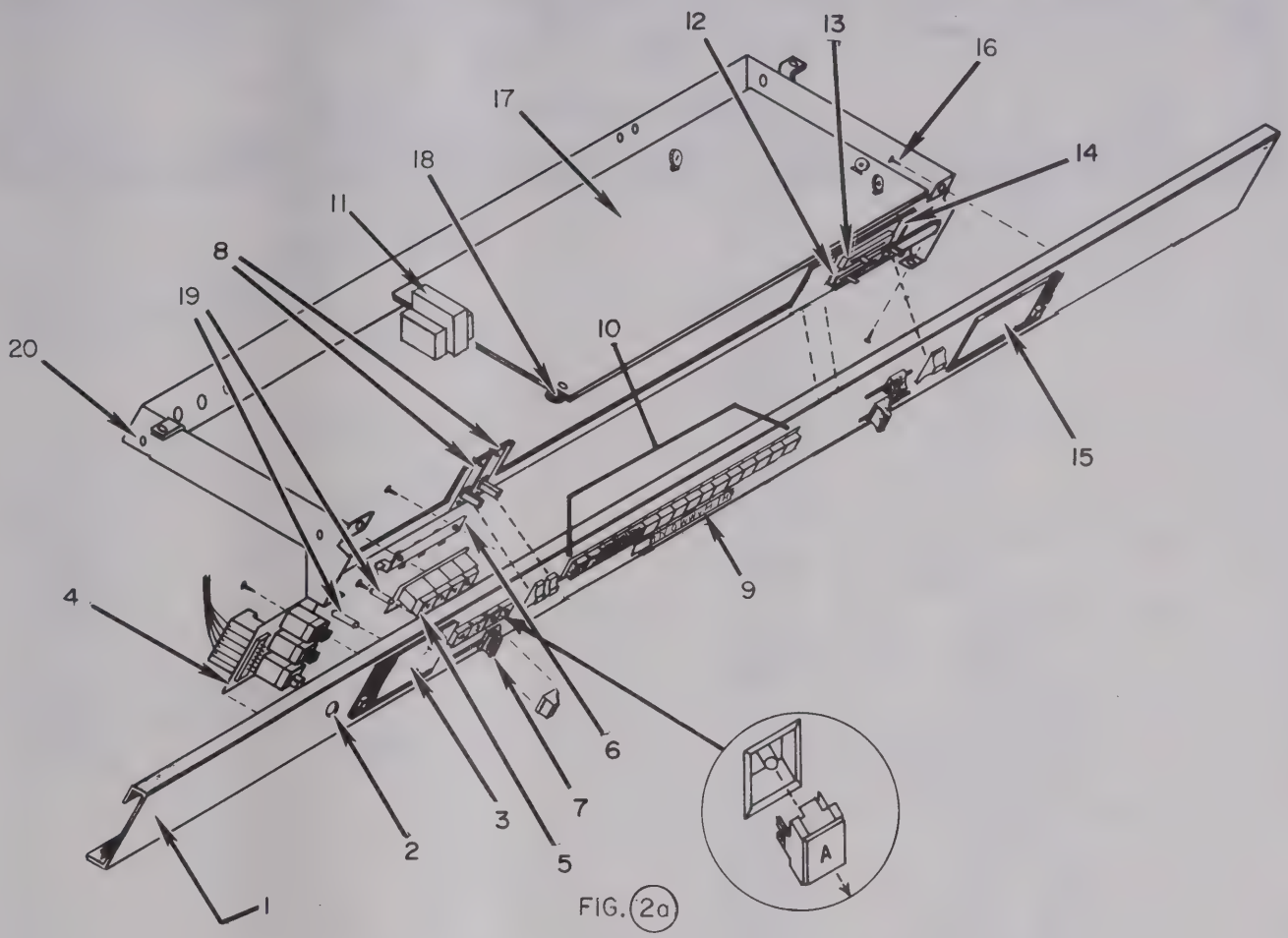
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FIG. 2a

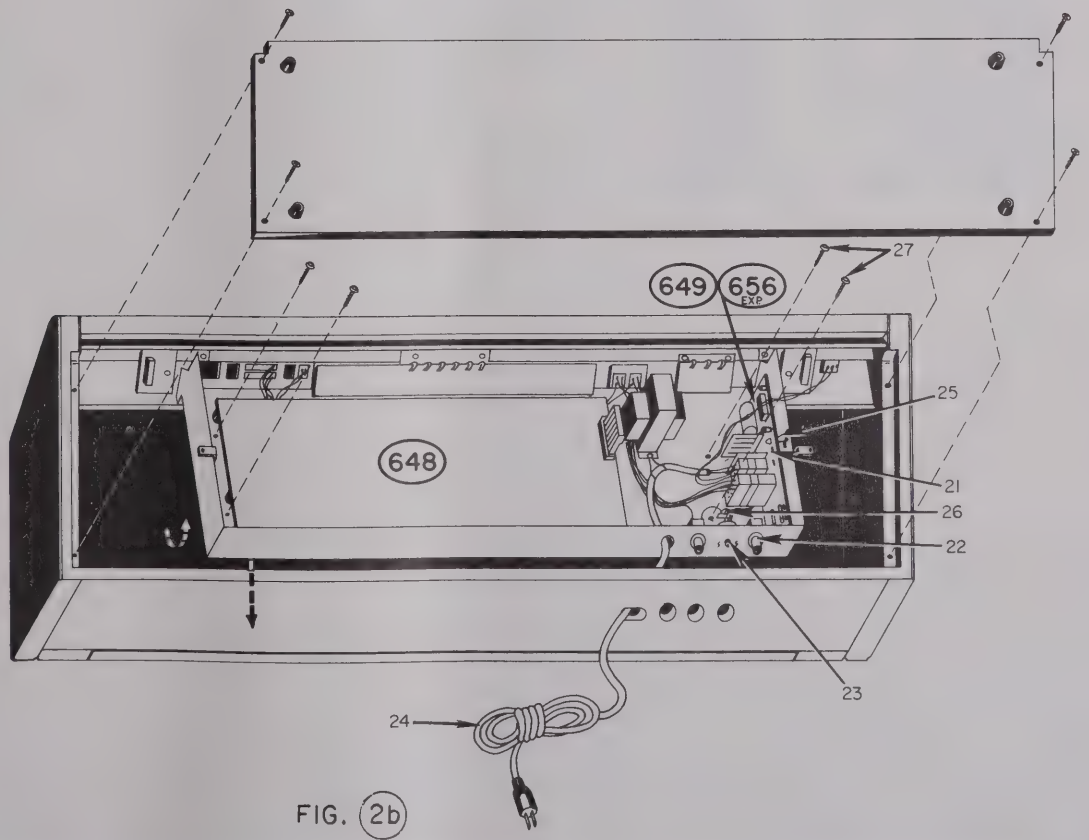
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FIG. 2b

(648)

AV-64 PATTERN & VOICE GENERATOR		124-000648
Transistor Q1 - 17, 19 - 26, 28 - 31		001-021173
Q 18, 27		001-021314
Diodes D1 - 59		001-226080
40 Pin Socket (Qty. 3)		004-046770
14 Pin Socket (Qty. 31)		.004-050500
16 Pin Socket (Qty. 1)		004-050501
9 Circuit Wafer Molex J50, 52, 64		005-044532
12 Circuit Wafer Molex J51		005-044738
6 Circuit Wafer Molex J56,61,62,63		005-044742
15 Circuit Wafer Molex J54		005-044743
6 Circuit Connector Molex J53,55,57,62		005-051168
4 Circuit Connector Molex J58,59,60		005-051169
3 Circuit Connector Molex J61,63		005-051170
Integrated Circuits IC 30 - 32		075-000324
IC 29		.075-000339
IC 3		075-000450
IC 1		075-000460
IC 2		075-000462
IC 35		075-003280
IC 8,16,20,26,28		075-004001
IC4-7, 10-12, 22, 27		.075-004011
IC 9, 17,19,25,33		075-004013
IC 18, 24		075-004023
IC 13, 15		075-004069
IC 14		.075-004081
IC 21, 23, 34		075-004093
Capacitor, Tantalum		
.33 MFD/25V	C38	414-240042
.47 MFD/25V	C24	414-240052
4.7 MFD/25V	C86	414-240132
Capacitor, Electrolytic		
100 MFD/25V	C83, 106	432-107259
22 MFD/50V	C19	432-256509
10 MFD/50V	C105	432-106509
1 MFD/50V	C42,46,49,52,85,89	443-105502
Capacitor, Monolithic		
1 MFD	C42,46,49,52,85,89	438-200373
.001 MFD	C84,88	438-210013
.01 MFD	C1-17,22,37,39,41,87,91-99	438-210133
.022 MFD	C75, 81	.438-210173
.047 MFD	C21, 36	438-210213
.10 MFD	C18,20,56,63-65,68-70,73	438-210253
.15 MFD	C100	438-210273
.22 MFD	C76, 82	438-210292
100 PFD	C40,79	.440-210132
333PFD	C23	440-210192
470 PFD	C74,77,78,80	440-210212
680 PFD	C66, 67	440-210232
820 PFD	C 71, 72	440-210242
2200 PFD	C 25,53	.440-210292
3300 PFD	C 56, 57, 59-62	440-210312
4700 PFD	C 54	440-210332
8200 PFD	C 50,51	440-210362
.015 MFD	C 45	.440-210392
.018 MFD	C 26	440-210402
.027 MFD	C 30, 47, 48	440-210422
.056 MFD	C 29, 33	440-210462
.068 MFD	C 32	440-210472
.082 MFD	C 28, 31	440-210482
.12 MFD	C 27,34,35	440-210502

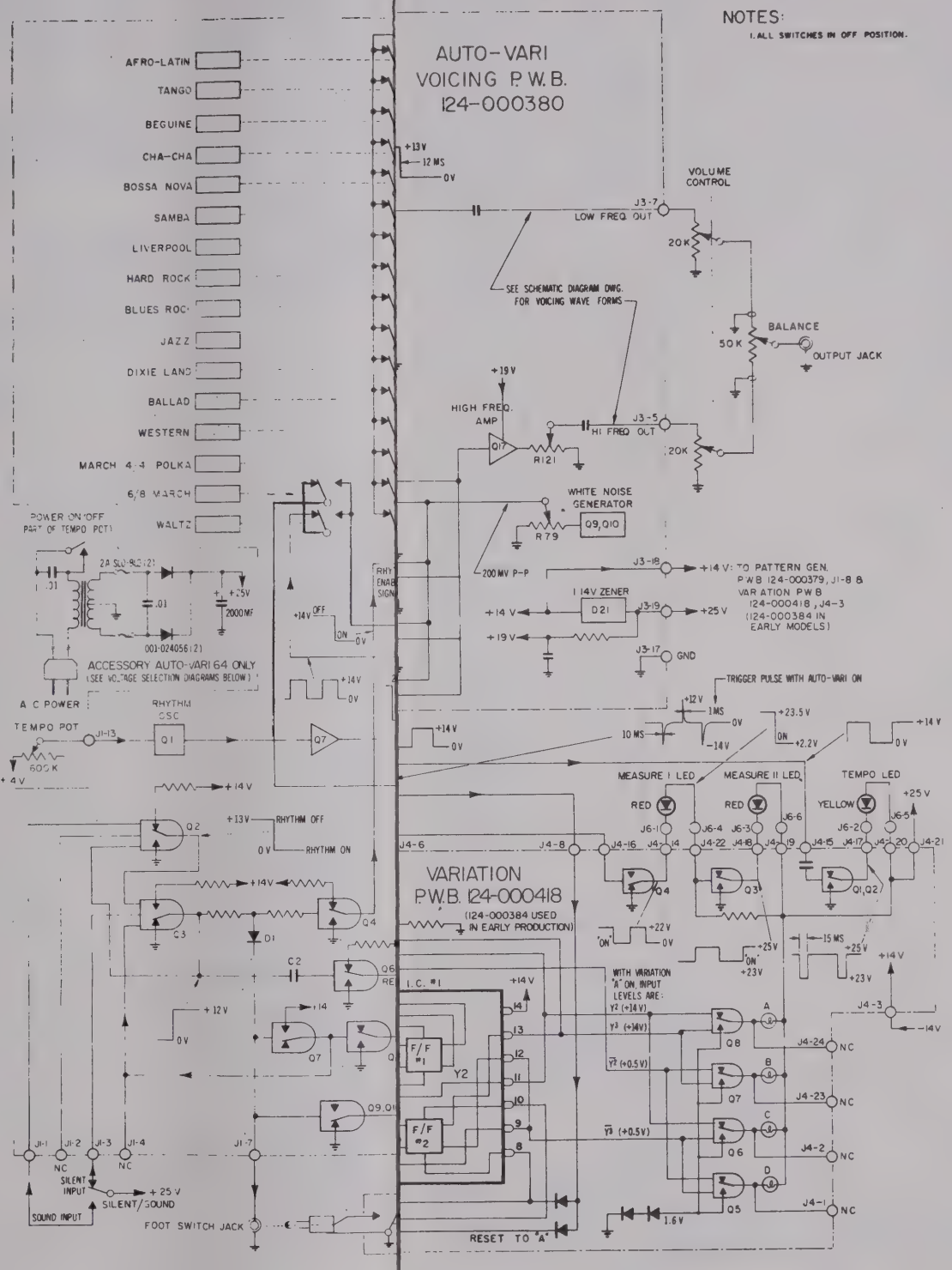
(649)

AV 64 POWER SUPPLY P.W.B. (DOMESTIC)		124-0000649
TRANSISTOR	Q1	001-022103
DIODE, RECTIFIER (2 USED)		001-024052
6 CIRCUIT CONNECTOR		005-051168
PLUG AND TERM. ASSEMBLY		005-053500
RECEPTICLE AND TERM. ASSEMBLY		005-056124
CLAMP		013-049317
FUSE CLIP (4 USED)		013-050528
FUSE .8 AMP (2 USED)		016-040426
HEAT SINK		041-054101
INTEGRATED CIRCUIT IC1		075-017915
CAPACITOR, ELECTROLYTIC		
C3	10MFD/50V	432-106509
C2	22MFD/50V	432-256509
C1	2000/2200MFD/50V	434-208509
SCREW (2 USED)		827-040518
NUT (2 USED)		999-001258

(656)

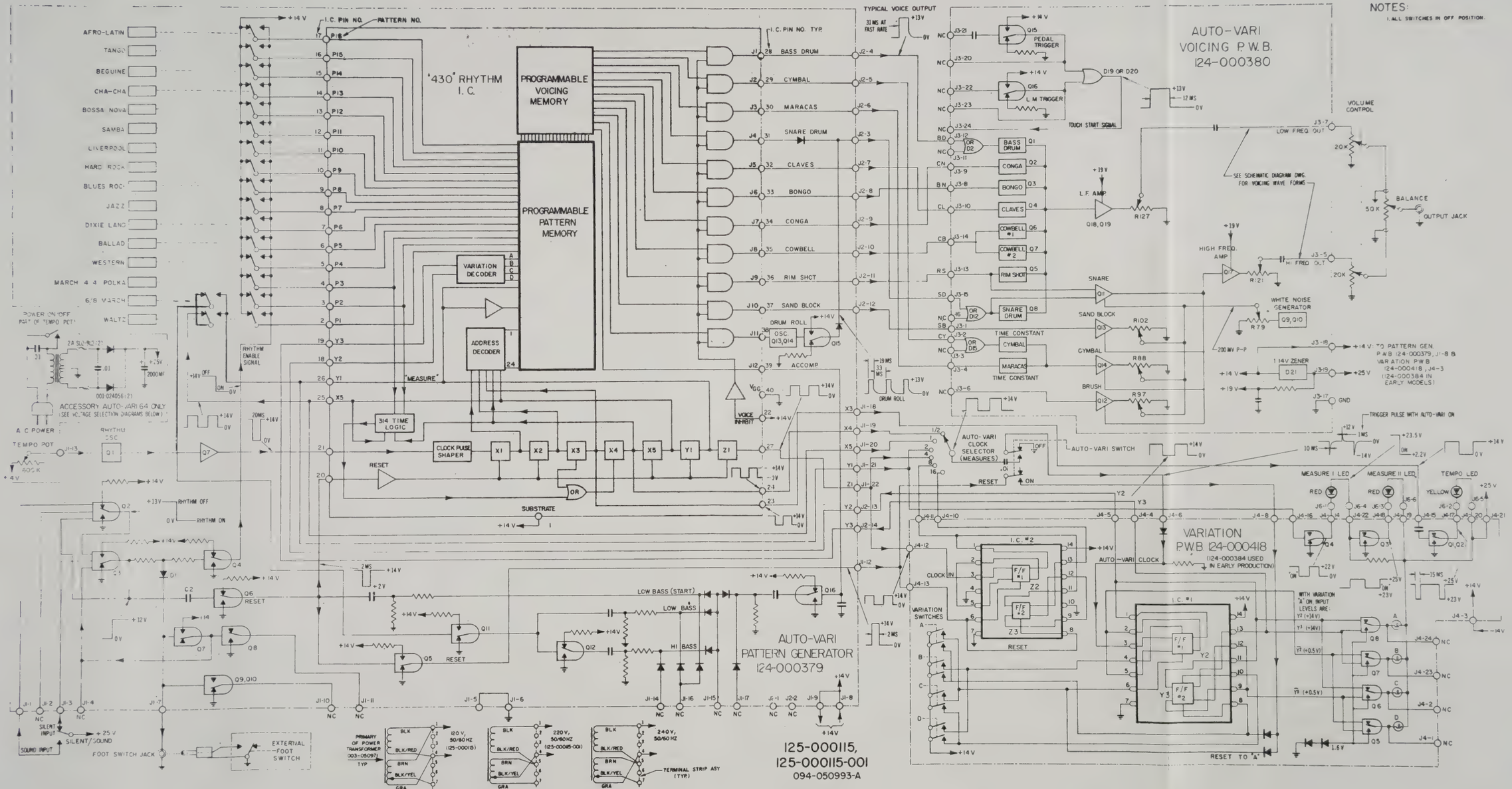
AV 64 POWER SUPPLY P.W.B. (EXPORT)		124-000656
TRANSISTOR	Q1	001-022103
DIODE, RECTIFIER (2 USED)		001-024052
6 CIRCUIT CONNECTOR		005-051168
PLUG AND TERM. ASSEMBLY		005-053500
RECEPTICLE AND TERM. ASSEMBLY		005-056124
CLAMP		013-049317
FUSE CLIP (4 USED)		013-050529
FUSE CAMRIDGE 400MA (2 USED)		016-050612
HEAT SINK		041-054101
INTEGRATED CIRCUIT IC1		075-017915
CAPACITOR, ELECTROLYTIC		
C3	10MFD/50V	432-106509
C2	22MFD/50V	432-256509
C1	2000/2200MFD/50V	434-208509
SCREW (2 USED)		827-040518
NUT (2 USED)		999-001258

SECTION VII
APPENDIX



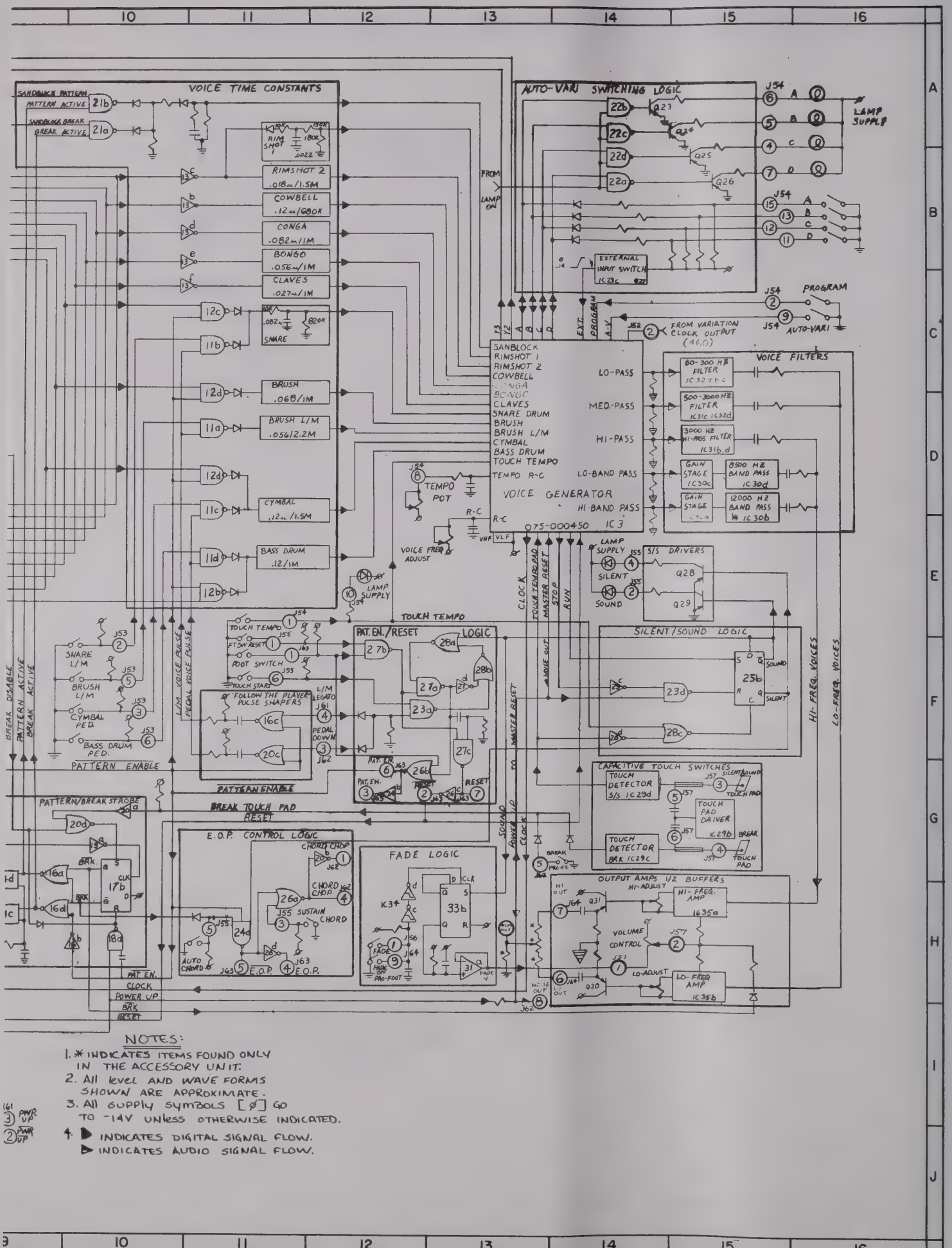
Logic Diagram

Model: 101100



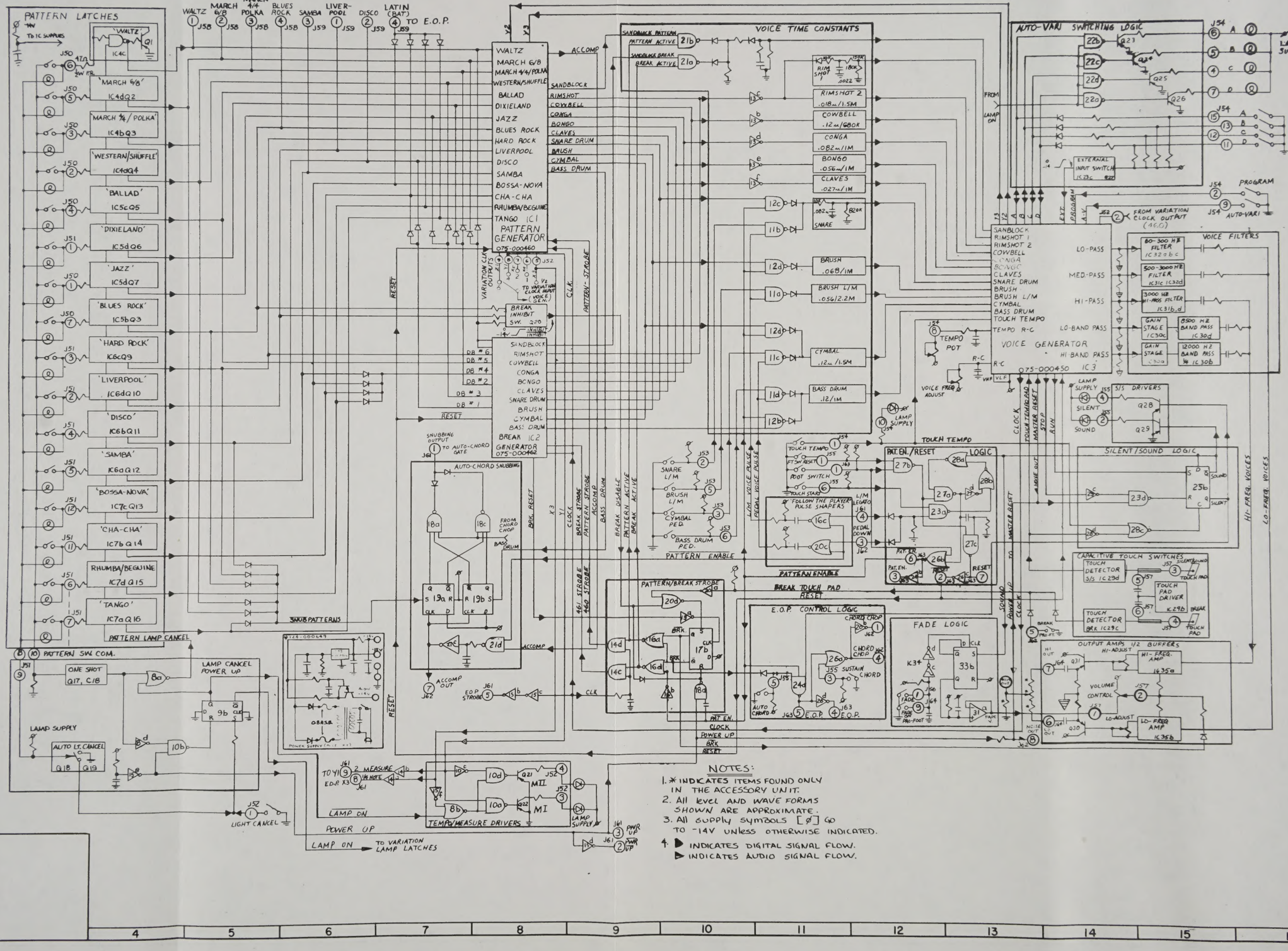
Logic Diagram

Model: 101100



NOTES:

1. * INDICATES ITEMS FOUND ONLY IN THE ACCESSORY UNIT.
2. All level AND WAVE FORMS SHOWN ARE APPROXIMATE.
3. All supply symbols [ø] GO TO -14V UNLESS OTHERWISE INDICATED.
4. ▶ INDICATES DIGITAL SIGNAL FLOW.
   ▷ INDICATES AUDIO SIGNAL FLOW.



NOTES:

1. * INDICATES ITEMS FOUND ONLY IN THE ACCESSORY UNIT.
2. All level and wave forms shown are approximate.
3. All supply symbols [ø] go to -14V unless otherwise indicated.
4. ▶ INDICATES DIGITAL SIGNAL FLOW.
   ▶ INDICATES AUDIO SIGNAL FLOW.

Logic Diagram

Model: 101300

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